

Section 4. Petroleum

Petroleum Overview

The 27 petroleum products included in the Combined State Energy Data System (CSEDS) are explained in this section. For 12 of these products, the means of estimating their individual consumption by State is described in individual sections. The 12 petroleum products are:

- asphalt (AS)
- aviation gasoline (AV)
- distillate fuel (DF)
- jet fuel, kerosene-type (JK)
- jet fuel, naphtha-type (JN)
- kerosene (KS)
- liquefied petroleum gases (LG)
- lubricants (LU)
- motor gasoline (MG)
- petroleum coke (PC)
- residual fuel (RF)
- road oil (RD)

The remaining 15 products are described in the section “Other Petroleum Products” and include the following:

- crude oil, including lease condensate (CO)
- miscellaneous petroleum products (MS)
- natural gasoline (NA) (including isopentane)
- petroleum feedstocks, naphtha less than 401° F (FN)
- petroleum feedstocks, other oils equal to or greater than 401° F (FO)
- petroleum feedstocks, still gas (FS)
- plant condensate (PL)
- pentanes plus (PP)

- special naphthas (SN)
- still gas (SG)
- unfractionated stream (US)
- waxes (WX)
- unfinished oils (UO)
- motor gasoline blending components (MB)
- aviation gasoline blending components (AB)

The last petroleum documentation section, “Petroleum Summaries,” describes how the 27 petroleum products are combined for each major end-use sector’s estimated consumption.

Table A2 summarizes the petroleum products’ end-use assignments in CSEDS. Shown in this table are the first four letters of the seven-letter variable names used to identify all energy sources. The first two letters identify the petroleum product and the next two letters identify the end-use sector. For example, the table shows that the aviation gasoline estimated to be consumed by the transportation sector is all aviation gasoline consumed, and that there is some estimated consumption of lubricants in the industrial and transportation sectors, while distillate fuel is consumed in every sector.

Asphalt and Road Oil

Physical Units

There are no State-level consumption data for asphalt and road oil available. Therefore, the State-level sales data are used to apportion the national consumption numbers to the States.

Table A2. Summary of Petroleum Products in the State Energy Data System

Petroleum Products	Residential Sector Estimated Consumption (RC)		Commercial Sector Estimated Consumption (CC)		Industrial Sector Estimated Consumption (IC)		Transportation Sector Estimated Consumption (AC)		Electric Utility Sector Estimated Consumption (EU)		Total Estimated Consumption (TC)
Asphalt and Road Oil (AR)					ARIC					=	ARTC
Aviation Gasoline (AV)					+		AVAC			=	AVTC
Distillate Fuel (DF)	DFRC	+	DFCC	+	DFIC	+	DFAC	+	DFEU	=	DFTC
Jet Fuel, Kerosene (JK)	+		+		+		+		+	=	+
Jet Fuel, Naphtha (JN)							JKAC		JKEU	=	JKTC
							+				+
							JNAC			=	JNTC
							+				+
Kerosene (KS)	KSRC	+	KSCC	+	KSIC					=	KSTC
	+		+		+						+
Liquefied Petroleum Gases (LG)	LGRC	+	LGCC	+	LGIC	+	LGAC			=	LGTC
					+		+				+
Lubricants (LU)			+		LUIC		LUAC			=	LUTC
					+		+				+
Motor Gasoline (MG)			MGCC		MGIC		MGAC			=	MGTC
			+		+		+				+
Residual Fuel (RF)			RFCC		RFIC	+	RFAC	+	RFEU	=	RFTC
					+				+		+
Other Petroleum Products (PO)					POIC ¹				PCEU ²	=	POTC
Total Petroleum (PA)	PARC	+	PACC	+	PAIC	+	PAAC	+	PAEU	=	PATC

¹ The category "Other petroleum products" consumed by the industrial sector comprises crude oil, including lease condensate; unfinished oils; plant condensate; aviation gasoline and motor gasoline blending components; natural gasoline; petroleum feedstocks (naphtha less than 401° F, other oils equal to or

greater than 401° F, and still gas); pentanes plus; special naphthas; still gas; unfractionated stream; waxes; miscellaneous petroleum products; and petroleum coke for industrial use.

² Petroleum coke consumed at electric utilities.

The asphalt and road oil sales data are in short tons, while the consumption data are in thousand barrels. Because the sales data are used only for apportioning the U.S. consumption data to the States, they do not need to be converted into thousand barrels.

The four data series that are used to estimate consumption of asphalt and road oil are ("ZZ" in the variable name represents the two-letter State code that differs for each State):

ASINPZZ = asphalt sold for use in the industrial sector of each State, in short tons;
 ASTCPUS = asphalt total consumed in the United States, in thousand barrels;
 RDINPZZ = road oil sold for use in the industrial sector of each State, in short tons; and
 RDTCPUS = road oil total consumed in the United States, in thousand barrels.

All asphalt consumption is assigned to the industrial sector because it is used in construction activity. ASINPZZ represents all asphalt sold as paving products, as roofing products, and for all other uses.

ASTCPUS represents total U.S. consumption of asphalt, and RDTCPUS represents total U.S. consumption of road oil. Both are the "product supplied" data series in the publication *Petroleum Supply Annual*, published by the Energy Information Administration (EIA). Beginning in 1983, asphalt product supplied includes road oil, and RDTCPUS is entered as zero in CSEDS.

The source of the third variable, RDINPZZ, is the report series "Sales of Asphalt" for 1960 through 1980, published by EIA. This sales series was discontinued after the 1980 report. Values for 1981 and 1982 are estimated as described under "Additional Notes" in this section. Beginning with 1983 data, when road oil is included in asphalt product supplied data in the source publication, RDINPZZ is entered as zero in CSEDS.

To calculate State consumption estimates of asphalt, total sales of asphalt in the United States to the industrial sector is first calculated as the sum of the State data:

$$ASINPUS = \Sigma ASINPZZ$$

Each State's consumption of asphalt in the industrial sector (ASICPZZ) is calculated to be in proportion to each State's sales:

$$\begin{aligned}
 ASICPZZ &= (ASINPZZ / ASINPUS) * ASTCPUS \\
 ASICPUS &= \Sigma ASICPZZ
 \end{aligned}$$

Since all consumption of asphalt is assumed to be in the industrial sector, the total consumption of asphalt in each State equals the industrial sector consumption:

$$ASTCPZZ = ASICPZZ$$

The State sales of road oil are used to create an estimate of State consumption of road oil.

The U.S. total of all road oil sales to the industrial sector is calculated by adding all of the States' sales:

$$RDINPUS = \Sigma RDINPZZ$$

Each State's consumption of road oil in the industrial sector (RDICPZZ) is calculated to be in proportion to each State's sales:

$$\begin{aligned}
 RDICPZZ &= (RDINPZZ / RDINPUS) * RDTCPUS \\
 RDICPUS &= \Sigma RDICPZZ
 \end{aligned}$$

Since all road oil consumption is assumed to be in the industrial sector, the total consumption of road oil in each State equals the industrial sector consumption:

$$RDTCPZZ = RDICPZZ$$

Asphalt and road oil consumption are added together:

$$\begin{aligned}
 ARICPZZ &= ASICPZZ + RDICPZZ \\
 ARICPUS &= \Sigma ARICPZZ \\
 ARTCPZZ &= ASTCPZZ + RDTCPZZ \\
 ARTCPUS &= \Sigma ARTCPZZ
 \end{aligned}$$

British Thermal Units (Btu)

Asphalt and road oil have a heat content value of approximately 6.636 million Btu per barrel. This factor is applied to convert asphalt and road oil estimated consumption from physical units to Btu:

$$\begin{aligned}\text{ARICBZZ} &= \text{ARICPZZ} * 6.636 \\ \text{ARICBUS} &= \Sigma \text{ARICBZZ}\end{aligned}$$

Because all asphalt and road oil are assumed to be used by the industrial sector, total asphalt and road oil consumption in each State and in the United States is assumed to equal the industrial sector consumption:

$$\begin{aligned}\text{ARTCBZZ} &= \text{ARICBZZ} \\ \text{ARTCBUS} &= \text{ARICBUS}\end{aligned}$$

Additional Notes on Asphalt and Road Oil

Because the Federal Government stopped collecting asphalt and road oil sales data in 1980, the source for these numbers in recent years has been reports published by the Asphalt Institute. There is an inherent problem in the methodology of using sales to estimate consumption because asphalt and road oil sold by a producer in one State may be easily transported across State lines and consumed in a neighboring State. The Asphalt Institute acknowledges this problem and estimates that, in any one year, about 15 States may have consumption estimates as much as 20 percent too high or too low.

Total U.S. consumption of asphalt and road oil are the product supplied data series from the EIA publication *Petroleum Supply Annual*. Beginning with 1983 data, the road oil data series is no longer published separately but is included in the asphalt product supplied. The sum of the two series for all years in CSEDS is a continuous series.

The EIA report series "Sales of Asphalt," which is the source for road oil sales by State (RDINPZZ) in CSEDS for 1960 through 1980, was discontinued after the 1980 report. For 1981 and 1982, State estimates of road oil sales were created by first converting the annual total U.S. road oil product supplied data into short tons (one short ton contains 5.5 barrels of road oil). Then, the U.S. total road oil product supplied, in short tons, was disaggregated to each State in proportion to the State's share of total U.S.

asphalt sales as reported in the Asphalt Institute's *Report on Sales of Asphalt in the U.S.*

Data Sources for Asphalt and Road Oil

ASINPZZ — Asphalt sold to the industrial sector by State.

- 1960 through 1977: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Asphalt," the specific tables are:
 - 1960 through 1962: Table 6.
 - 1963 through 1977: Table 5.
- 1978 through 1980: EIA, *Energy Data Reports*, "Sales of Asphalt," Table 2.
- 1981 through 1986: The Asphalt Institute, *Asphalt Usage 1987 United States and Canada*, Table B.
- 1987 and 1988: The Asphalt Institute, *Asphalt Usage 1988 United States and Canada*, Tables A and B for State data. *Asphalt Usage 1989 United States and Canada*, page 2 for revised U.S. totals. The Asphalt Institute did not publish corresponding revised State data but did advise EIA on an estimation procedure to adjust 19 State values to sum to the revised U.S. totals.
- 1989 through 1995: The Asphalt Institute, *Asphalt Usage United States and Canada*, table titled "U.S. Asphalt Usage."
- 1996 and 1997: The Asphalt Institute, *Asphalt Usage United States and Canada*, table titled "1997 vs. 1996 U.S. Asphalt Usage."

ASTCPUS — Asphalt total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2. (Beginning in 1983, this variable includes road oil.)

RDINPZZ — Road oil sold to the industrial sector by State.

- 1960 through 1977: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Asphalt." The specific tables are:
 - 1960 through 1962: Table 6.

- 1963 through 1977: Table 5.
- 1978 through 1980: EIA, *Energy Data Reports*, “Sales of Asphalt,” Table 2.
- 1981 and 1982: EIA estimates. (See explanation in “Additional Notes” on page 358.)
- 1983 forward: Road oil is included in asphalt data (see ASINPZZ).

RDTCPUS — Road oil total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 2.
- 1983 forward: EIA, *Petroleum Supply Annual*, Table 2, included in “Asphalt and Road Oil.”

Aviation Gasoline

Physical Units

The three data series used to estimate consumption of aviation gasoline are:

- AVMIPZZ = aviation gasoline issued to the military in each State, in thousand barrels;
- AVNMMZZ = aviation gasoline sold to nonmilitary users in each State, in thousand gallons; and
- AVTCPUS = aviation gasoline total consumed in the United States, in thousand barrels.

The U.S. Department of Transportation, Federal Highway Administration publishes the nonmilitary aviation gasoline sales data by State (AVNMMZZ) in *Highway Statistics*.

AVMIPZZ is the issues of aviation gasoline to the military in each State and is obtained from the U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center.

Total U.S. consumption of aviation gasoline (AVTCPUS) is the product supplied data series in the publication *Petroleum Supply Annual*, published by the Energy Information Administration (EIA).

The State-level data series are summed to provide totals for the United States:

$$\text{AVMIPUS} = \Sigma \text{AVMIPZZ}$$

$$\text{AVNMMUS} = \Sigma \text{AVNMMZZ}$$

The State sales of nonmilitary aviation gasoline data are converted from thousand gallons to thousand barrels (42 gallons = 1 barrel):

$$\text{AVNMPZZ} = \text{AVNMMZZ} / 42$$

The U.S. nonmilitary sales is the sum of the States’ sales:

$$\text{AVNMPUS} = \Sigma \text{AVNMPZZ}$$

The total sales of aviation gasoline is estimated as the sum of nonmilitary sales and military issues:

$$\text{AVTTPZZ} = \text{AVNMPZZ} + \text{AVMIPZZ}$$

$$\text{AVTTPUS} = \Sigma \text{AVTTPZZ}$$

All aviation gasoline is assumed to be used by the transportation sector. An estimate of aviation gasoline consumption by the transportation sector by State (AVACPZZ) is calculated by assuming that each State consumes aviation gasoline in proportion to the amount sold to that State:

$$\text{AVACPZZ} = (\text{AVTTPZZ} / \text{AVTTPUS}) * \text{AVTCPUS}$$

$$\text{AVACPUS} = \Sigma \text{AVACPZZ}$$

Total aviation gasoline consumption in each State, AVTCPZZ, equals the transportation sector consumption in each State:

$$\text{AVTCPZZ} = \text{AVACPZZ}$$

British Thermal Units (Btu)

Aviation gasoline has a heat content value of approximately 5.048 million Btu per barrel. This factor is applied to convert aviation gasoline estimated consumption from physical units to Btu:

$$\begin{aligned} \text{AVACBZZ} &= \text{AVACPZZ} * 5.048 \\ \text{AVACBUS} &= \Sigma \text{AVACBZZ} \end{aligned}$$

Because all aviation gasoline is assumed to be used for transportation, aviation gasoline total consumption in each State and in the United States equals the transportation sector consumption:

$$\begin{aligned} \text{AVTCBZZ} &= \text{AVACBZZ} \\ \text{AVTCBUS} &= \text{AVACBUS} \end{aligned}$$

Additional Notes on Aviation Gasoline

Aviation gasoline issues to the military for each State (AVMIPZZ) are obtained from the U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center. There are no data available for 1960 through 1974, and the data available for 1975 and 1976 are not consistent; therefore, the 1977 values are used for 1960 through 1976 in CSEDS. The data are reported by fiscal year for 1977 through 1988 and are taken from the Defense Energy Information System. For 1989 and 1990, fiscal-year data from two databases, Defense Fuel Automated Management System and the Into-Plane Database, are summed. For 1991 forward, data from the same two databases, reported by calendar year, are used.

Data Sources for Aviation Gasoline

AVMIPZZ — Aviation fuel issued to the military in the United States by State.

- 1960 through 1974: No data are available. The 1977 data are used for each year.
- 1975 and 1976: No consistent data series are available. The 1977 data are used for both years.
- 1977 through 1988: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center, Defense Energy Information

System, military retail issues based on fiscal year data. The District of Columbia issues are assumed to be zero; therefore, values reported for the District of Columbia are added to Maryland.

- 1989 and 1990: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center. State data for the fiscal year from two databases are summed: Defense Fuel Automated Management System (military wholesale issues) and Into-Plane Database (military purchases from commercial airports). Into-plane values reported for the District of Columbia are added to Virginia.
- 1991 through 1995, 1997: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center. State data for the calendar year from two databases are summed: Defense Fuel Automated Management System (military wholesale issues) and Into-Plane Database (military purchases from commercial airports). Into-plane values reported for the District of Columbia are added to Virginia.
- 1996: The data series for 1996 is temporarily unavailable. Simple averages of 1995 and 1997 State data are used to estimate 1996 values.

AVNMMZZ — Aviation gasoline sold to nonmilitary users by State.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table G-24 in 1965 and Table MF-24 in 1966 forward.

AVTCPUS — Aviation gasoline total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Distillate Fuel

Physical Units

Since State-level and end-use consumption data for distillate fuel (except for that consumed by electric utilities) are not available, sales of distillate fuel into or within each State, in thousand barrels, published by the Energy Information Administration (EIA) are used to estimate distillate fuel consumption. The sales data are adjusted to sum to the Petroleum Administration for Defense District subtotals of the EIA distillate fuel product supplied data series. Both the sales data and the adjusted sales series are published in the EIA *Fuel Oil and Kerosene Sales Report*. The following variable names have been assigned to the adjusted sales series (“ZZ” in the variable names represents the two-letter State code that differs for each State):

- DFBKPZZ = distillate fuel adjusted sales for vessel bunkering use (i.e., the fueling of commercial or private boats, such as pleasure craft, fishing boats, tugboats, and ocean-going vessels, including vessels operated by oil companies, and fueling for other marine purposes), excluding that sold to the Armed Forces;
- DFCMPZZ = distillate fuel adjusted sales to commercial establishments for space heating, water heating, and cooking;
- DFIBPZZ = distillate fuel adjusted sales to industrial establishments for space heating and for other industrial use (i.e., for all uses to mines, smelters, plants engaged in producing manufactured products, in processing goods, and in assembling), including farm use;
- DFMIPZZ = distillate fuel adjusted sales to the Armed Forces, regardless of use;
- DFOCPZZ = distillate fuel adjusted sales for oil company use, including all fuel oil, crude oil, or acid sludge used as fuel at refineries, by pipelines, or in field operations;
- DFOFPZZ = distillate fuel adjusted sales as diesel fuel for off-highway use in construction (i.e., earthmoving equipment, cranes, stationary generators, air compressors, etc.) and for off-highway uses other than construction (i.e., logging);

- DFONPZZ = distillate fuel adjusted sales as diesel fuel for on-highway use (i.e., as engine fuel for trucks, buses, and automobiles);
- DFOTPZZ = distillate fuel adjusted sales for all other uses not identified in other adjusted sales categories;
- DFRRPZZ = distillate fuel adjusted sales to the railroads for use in fueling trains, operating railroad equipment, space heating of buildings, and other operations; and
- DFRSPZZ = distillate fuel adjusted sales to the residential sector for space heating, water heating, and cooking, excluding farm houses.

Three series are used in CSEDS for consumption data:

- DKEUPZZ = distillate fuel consumed by electric utilities, in thousand barrels;
- JKEUPZZ = kerosene-type jet fuel consumed by electric utilities, in thousand barrels; and
- DFTCPUS = distillate fuel total consumed in the United States, in thousand barrels.

Distillate fuel consumed by electric utilities (DKEUPZZ) is collected by EIA on Form EIA-759, “Monthly Power Plant Report,” and predecessor forms. (See Note 4 at the end of this distillate fuel section for further information on changes in this series’ data definitions.) The series DKEUPZZ includes kerosene-type jet fuel consumed at electric utilities that is identified as JKEUPZZ. The kerosene-type jet fuel is subtracted from the distillate fuel data and accounted for in the jet fuel data described in a following section of this documentation.

Total consumption of distillate fuel in the United States, DFTCPUS, is the product supplied series in the EIA publication *Petroleum Supply Annual*.

To begin calculating distillate fuel State and end-use consumption, all of the State-level data series are summed to provide totals for the United States.

Next, the variables are combined as closely as possible into the major end-use sectors used in CSEDS. The residential sector adjusted sales and the commercial sector adjusted sales contain only DFRSPZZ and DFCMPZZ, respectively.

The adjusted sales of distillate fuel to the industrial sector for each State, DFINPZZ, is the sum of the distillate fuel adjusted sales for industrial use, including industrial space heating and farm use (DFIBPZZ), for oil company use (DFOCPZZ), for off-highway use (DFOFPZZ), and for all other uses (DFOTPZZ):

$$\begin{aligned}\text{DFINPZZ} &= \text{DFIBPZZ} + \text{DFOCPZZ} + \text{DFOFPZZ} + \text{DFOTPZZ} \\ \text{DFINPUS} &= \Sigma \text{DFINPZZ}\end{aligned}$$

The adjusted sales of distillate fuel to the transportation sector for each State, DFTRPZZ, is the sum of the distillate fuel adjusted sales for vessel bunkering, military use, railroad use, and the diesel fuel used on-highway:

$$\begin{aligned}\text{DFTRPZZ} &= \text{DFBKPZZ} + \text{DFMIPZZ} + \text{DFRRPZZ} + \text{DFONPZZ} \\ \text{DFTRPUS} &= \Sigma \text{DFTRPZZ}\end{aligned}$$

Adjusted sales of distillate fuel oil to the residential, commercial, industrial, and transportation sectors are added to create a subtotal of adjusted sales to all sectors other than the electric utility sector, DFNDPZZ:

$$\begin{aligned}\text{DFNDPZZ} &= \text{DFRSPZZ} + \text{DFCMPZZ} + \text{DFINPZZ} + \text{DFTRPZZ} \\ \text{DFNDPUS} &= \Sigma \text{DFNDPZZ}\end{aligned}$$

Consumption of distillate fuel by electric utilities (DFEUPZZ) is calculated by subtracting the kerosene-type jet fuel consumed by electric utilities from the input series DKEUPZZ:

$$\begin{aligned}\text{DFEUPZZ} &= \text{DKEUPZZ} - \text{JKEUPZZ} \\ \text{DFEUPUS} &= \Sigma \text{DFEUPZZ}\end{aligned}$$

The estimated U.S. distillate fuel consumption by all sectors other than the electric utility sector, DFNCPUS, is calculated by subtracting the distillate fuel consumption at electric utilities from the total U.S. distillate fuel consumption:

$$\text{DFNCPUS} = \text{DFTCPUS} - \text{DFEUPUS}$$

This U.S. subtotal of distillate fuel consumption by the four end-use sectors, DFNCPUS, is apportioned to the States by use of the end-use sectors' State-level adjusted sales data. The assumption is made that each State

consumes distillate fuel in proportion to the amount of adjusted sales to that State:

$$\text{DFNCPZZ} = (\text{DFNDPZZ} / \text{DFNDPUS}) * \text{DFNCPUS}$$

The end-use sectors' subtotal for each State, DFNCPZZ, is further divided into estimates for the four end-use sectors in proportion to each sector's adjusted sales. The estimated residential sector consumption in each State, DFRCPZZ, is calculated:

$$\begin{aligned}\text{DFRCPZZ} &= (\text{DFRSPZZ} / \text{DFNDPZZ}) * \text{DFNCPZZ} \\ \text{DFRCPUS} &= \Sigma \text{DFRCPZZ}\end{aligned}$$

The commercial sector's estimated consumption in each State, DFCCPZZ, is calculated:

$$\begin{aligned}\text{DFCCPZZ} &= (\text{DFCMPZZ} / \text{DFNDPZZ}) * \text{DFNCPZZ} \\ \text{DFCCPUS} &= \Sigma \text{DFCCPZZ}\end{aligned}$$

The industrial sector's estimated consumption in each State, DFICPZZ, is calculated:

$$\begin{aligned}\text{DFICPZZ} &= (\text{DFINPZZ} / \text{DFNDPZZ}) * \text{DFNCPZZ} \\ \text{DFICPUS} &= \Sigma \text{DFICPZZ}\end{aligned}$$

The transportation sector's estimated consumption in each State, DFACPZZ, is calculated:

$$\begin{aligned}\text{DFACPZZ} &= (\text{DFTRPZZ} / \text{DFNDPZZ}) * \text{DFNCPZZ} \\ \text{DFACPUS} &= \Sigma \text{DFACPZZ}\end{aligned}$$

Total State distillate fuel consumption is the sum of the end-use sectors' consumption subtotal and the electric utilities consumption:

$$\text{DFTCPZZ} = \text{DFNCPZZ} + \text{DFEUPZZ}$$

British Thermal Units (Btu)

Distillate fuel has a heat content value of approximately 5.825 million Btu per barrel. This factor is applied to convert distillate fuel estimated

consumption for the five consuming sectors from physical units to Btu as shown in the following examples:

$$\begin{aligned}\text{DFRCBZZ} &= \text{DFRCPZZ} * 5.825 \\ \text{DFCCBZZ} &= \text{DFCCPZZ} * 5.825 \\ \text{DFTCBZZ} &= \text{DFRCBZZ} + \text{DFCCBZZ} + \text{DFICBZZ} + \text{DFACBZZ} + \\ &\quad \text{DFEUBZZ}\end{aligned}$$

The U.S. Btu consumption estimates are calculated as the sum of all the States' data.

In the *State Energy Data Report* tables, "Estimates of Energy Input at Electric Utilities," the data used in the column headed "Light Oil" is the variable DKEUP (distillate fuel plus jet kerosene) in physical units. The Btu variable, DKEUB, is calculated:

$$\begin{aligned}\text{DKEUBZZ} &= \text{DFEUBZZ} + \text{JKEUBZZ} \\ \text{DKEUBUS} &= \Sigma \text{DKEUBZZ}\end{aligned}$$

Additional Notes on Distillate Fuel

1. "Deliveries" data are actually called "shipments" in the source document for 1960 and 1961; "consumption" for 1962 through 1966; "shipments" for 1967; "sales" from 1968 through 1978; "deliveries" for 1979 through 1987; and "adjusted sales" for 1988 forward.
2. State data for the variables DFONPZZ (on-highway use), DFOFPZZ (off-highway use), and DFOTPZZ (other) for 1967 are unavailable from published sources. These three variables compose the miscellaneous use category for distillate fuel, which is known for all years by State. State estimates of DFONPZZ and DFOFPZZ for 1967 were developed by dividing the 1966 values for DFONPZZ and DFOFPZZ by the 1966 total miscellaneous use for each State and applying these percentages to the 1967 total miscellaneous use for each State. The 1967 State estimates for DFOTPZZ are the remainder of the 1967 miscellaneous category after DFONPZZ and DFOFPZZ have been subtracted.
3. In 1979, EIA implemented a new survey form, EIA-172, to obtain deliveries of fuel oil and kerosene data and updated the list of

respondents. (A detailed explanation is published in the *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979.") In the new survey form, certain end-use categories were redefined—in many cases to collect more disaggregated data. The reclassifications resulted in some end-use categories that were no longer comparable with those in previous surveys. Where discontinuities occurred, estimates for the pre-1979 years have been made in the Combined State Energy Data System (CSEDS) to conform with the 1979 fuel oil deliveries classifications. The pre-1979 deliveries estimates are not published in this report, but are used in CSEDS to disaggregate the known U.S. total product supplied (consumption) into State and major end-use sector consumption estimates.

For distillate fuel deliveries in 1979, the end-use categories called "residential," "commercial," "industrial," and "farm" are available. The pre-1979 deliveries categories are called "heating" and "industrial" (which included farm use). While the pre-1979 categories individually are not continuous with the 1979 categories, their subtotals are related. That is, a general comparison can be made between the sum of residential, commercial, industrial, and farm deliveries in 1979 and the sum of heating and industrial deliveries in the pre-1979 years. Therefore, the following method was applied to present a comparable series for distillate fuel delivered to the residential, commercial, and industrial sectors:

- For each of the pre-1979 years, a subtotal was created for each State by adding each State's heating and industrial deliveries categories. A comparable 1979 subtotal was created by adding each State's residential, commercial, industrial, and farm deliveries categories.
- Residential, commercial, and industrial (including farm) shares of the subtotal in 1979 were calculated for each State.
- These 1979 end-use shares were then applied to each pre-1979 subtotal of distillate fuel deliveries in each State to create State estimates of end-use deliveries for 1960 through 1978.

The 1980 through 1982 distillate fuel deliveries data are based on the same survey as that used for 1979; therefore, the 1980 through 1982 data are directly comparable to 1979 data.

In 1984, EIA again updated the list of respondents for this survey, and the Form EIA-172 became the Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report." EIA did not conduct a fuel oil and kerosene deliveries survey for 1983. The 1983 estimates in CSEDS are based on 1984 data obtained from the Form EIA-821. Statistical procedures and methodologies used for the Form EIA-821 differ from those used in previous years. Therefore, the 1983 and forward sales data may not be directly comparable to the pre-1983 data. (In the source document, the deliveries data for 1983 forward are reported in thousand gallons. These data are first converted to thousand barrels before being entered into CSEDS.)

Some of the No. 2 diesel fuel reported as sold to the commercial and industrial sectors, DFCMPZZ and DFINPZZ, on the EIA forms may also be included in the on-highway data, DFONPZZ, obtained from the Federal Highway Administration. Included in the commercial sector is some diesel fuel consumed by government vehicles and school buses, and included in the industrial sector is some diesel fuel consumed by fleets of trucks. Because the specific quantities involved are unknown, CSEDS reflects the diesel fuel consumption as reported in the EIA *Petroleum Marketing Monthly* and no attempt has been made to adjust the end-use reporting.

4. The data on fuel oil consumed at electric utilities for all years and States are actual fuel oil consumption numbers collected from electric utilities on the EIA Form EIA-759, "Monthly Power Plant Report," and predecessor forms. Due to changes in fuel oil reporting classifications on the Form EIA-759 over the years, it is not possible to develop a thoroughly consistent series for all years. However, over time, data more accurately disaggregating fuel oil into distillate fuel and residual fuel have become available. For 1960 through 1969, only data on total fuel oil consumed at electric utilities by State are available. For 1970 through 1979, fuel oil consumed by plant type (internal combustion and gas turbine plants combined and steam plants) by State are available. For 1980 forward, data on consumption of light oil at all plant types combined and consumption of heavy oil at all plant types combined are available by State. In CSEDS, the following assumptions have been made:
 - 1960 through 1969 — State estimates of fuel oil consumption by plant type have been created for each year by applying the

shares of steam plants (primarily residual fuel) and internal combustion and gas turbine plants (primarily distillate fuel plus small amounts of jet kerosene) by State in 1970 to each year's total fuel oil consumption at electric utilities for 1960 through 1969.

- 1970 through 1979 — fuel oil consumed by steam plants is assumed to equal residual fuel consumption, and fuel oil consumed by internal combustion and gas turbine plants is assumed to equal distillate fuel plus jet kerosene consumption.
- 1980 and forward — total heavy oil consumption at all plant types is assumed to equal residual fuel consumption, and total light oil consumption at all plant types is assumed to equal distillate fuel plus jet kerosene consumption.

The data series thus derived for CSEDS for residual fuel and distillate fuel plus jet kerosene consumption at electric utilities is considered to be actual consumption at electric utilities for each State and each year.

Data Sources for Distillate Fuel

DFBKPZZ — Distillate fuel adjusted sales for vessel bunkering use by State, excluding that sold to the Armed Forces.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are:
 - 1960 and 1961: Table 17.
 - 1962 and 1963: Table 16.
 - 1964 and 1965: Table 15.
 - 1966 through 1975: Table 11.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 11.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFCMPZZ — Distillate fuel adjusted sales to the commercial sector for space heating, water heating, and cooking.

- 1960 through 1978: EIA estimates based on statistics of commercial sector deliveries of distillate fuel from the EIA, *Energy Data Report*, “Deliveries of Fuel Oil and Kerosene in 1979,” Table 1. State ratios based on 1979 commercial sector deliveries were applied to each State’s sum of heating plus industrial (including farm use) deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 363.)
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFIBPZZ — Distillate fuel adjusted sales to industrial establishments for space heating and for other industrial use, including farm use.

- 1960 through 1978: EIA estimates based on statistics of industrial sector deliveries of distillate fuel from the EIA, *Energy Data Report*, “Deliveries of Fuel Oil and Kerosene in 1979,” Table 1. State ratios based on 1979 industrial sector deliveries were applied to each State’s sum of heating plus industrial (including farm use) deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 363.)
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.

- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFMIPZZ — Distillate fuel adjusted sales for military use (including imports for the military) by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:
 - 1960 and 1961: Table 18.
 - 1962 and 1963: Table 17.
 - 1964 and 1965: Table 16.
 - 1966 through 1975: Table 12.
- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 12.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFOCPZZ — Distillate fuel adjusted sales for use by oil companies by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:

- 1960 and 1961: Table 14.
 - 1962 and 1963: Table 13.
 - 1964 and 1965: Table 12.
 - 1966 through 1975: Table 9.
 - 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 9.
 - 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.
 - 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.
- Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.
- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
 - 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFOFPZZ — Distillate fuel adjusted sales as diesel fuel for off-highway use by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:
 - 1960 through 1962: Table 19.
 - 1963 and 1964: Table 18.
 - 1965 through 1967: Table 17.
 - 1968 through 1975: Table 14.
- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 14.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.

- 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFONPZZ — Distillate fuel adjusted sales as diesel fuel for on-highway use by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:
 - 1960 through 1962: Table 19.
 - 1963 and 1964: Table 18.
 - 1965 through 1967: Table 17.
 - 1968 through 1975: Table 14.
- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 14.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFOTPZZ — Distillate fuel adjusted sales for all other uses not identified in other adjusted sales categories.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:
 - 1960 through 1962: Table 19.
 - 1963 and 1964: Table 18.
 - 1965 through 1967: Table 17.
 - 1968 through 1975: Table 14.
- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 14.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.

- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFRRPZZ — Distillate fuel adjusted sales for use by railroads by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:
 - 1960 and 1961: Table 16.
 - 1962 and 1963: Table 15.
 - 1964 and 1965: Table 14.
 - 1966 through 1975: Table 10.
- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 10.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFRSPZZ — Distillate fuel adjusted sales to the residential sector for space heating, water heating, and cooking.

- 1960 through 1978: EIA estimates based on statistics of residential sector deliveries of distillate fuel from the EIA, *Energy Data Report*, “Deliveries of Fuel Oil and Kerosene in 1979,” Table 1. State ratios based on 1979 residential sector deliveries were applied to each

State’s sum of heating plus industrial (including farm use) deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 363.)

- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983 and 1984: July 1985 issue, Table A12.
 - 1985 and 1986: July 1987 issue, Table A16.
 - 1987: June 1988 issue, Table A16.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 16.

DFTCPUS — Distillate fuel total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Petroleum Statement Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

DKEUPZZ — Distillate fuel consumed by the electric utilities, including kerosene-type jet fuel.

- EIA, Form EIA-759, “Monthly Power Plant Report,” and predecessor forms. The following assumptions have been made:
 - 1960 through 1969: Only total fuel oil consumed at electric utilities by State is available. State estimates of distillate fuel consumption were created for each year by applying the shares of internal combustion and gas turbine plants (primarily distillate fuel plus small amounts of jet kerosene) by State from 1970 to each year’s total fuel oil consumption at electric utilities for 1960 through 1969.
 - 1970 through 1979: Fuel oil consumed by plant type by State is available. Fuel oil consumed by internal combustion and gas turbine plants combined is assumed to equal distillate and jet kerosene consumption.
 - 1980 forward: Consumption of light and heavy oil at all plant types by State is available. Total light oil consumption at all

plant types is assumed to equal distillate and jet kerosene consumption.

Jet Fuel

There are two types of jet fuel with different heat contents, kerosene-type jet fuel (JK) and naphtha-type jet fuel (JN), which are added in the Combined State Energy Data System (CSEDS) to give total jet fuel (JF). Jet fuel is used primarily for transportation, although, for 1972 through 1982, small amounts of the kerosene-type jet fuel were reported as used in the electric utility sector.

Kerosene-Type Jet Fuel

Physical Units

Data series used to calculate kerosene-type jet fuel consumption estimates are ("ZZ" in the variable name represents the two-letter State code that differs for each State):

JKTCPUS = kerosene-type jet fuel total consumed, in thousand barrels;
JKEUPZZ = the electric utility sector consumption of kerosene-type jet fuel in each State, in thousand barrels; and
JKTTPZZ = kerosene-type jet fuel total sold, in thousand gallons.

Total U.S. consumption of kerosene-type jet fuel, JKTCPUS, is the product supplied data series in the publication *Petroleum Supply Annual*, published by the Energy Information Administration (EIA).

Kerosene-type jet fuel consumed by electric utilities, JKEUPZZ, is published by EIA in the *Cost and Quality of Fuels for Electric Utility Plants*. These data are available for 1972 through 1982 only. Consumption in all other years is assumed to be zero.

Kerosene-type jet fuel total sold, JKTTPZZ, was collected by the Ethyl Corporation, Petroleum Chemicals Division, for 1960 through 1983 and by EIA for 1984 forward. The Ethyl Corporation data are sales to

commercial users and are used to represent total sales based on the assumption that there is little military use of kerosene-type jet fuel during 1960 through 1983. (See Note 1 in the "Additional Notes" section for the source reference for this assumption.) The EIA data for 1984 forward include commercial and military sales.

U.S. totals for the two State series are calculated as the sum of the State data.

Most kerosene-type jet fuel is used by the transportation sector. The transportation sector consumption for the United States (JKACPUS) is estimated as the difference between the total kerosene-type jet fuel consumed and the electric utility consumption:

$$JKACPUS = JKTCPUS - JKEUPUS$$

It is assumed that kerosene-type jet fuel consumption in each State is in proportion to the amount sold in each State:

$$JKACPZZ = (JKTTPZZ / JKTTPUS) * JKACPUS$$

Total kerosene-type jet fuel by State is estimated as:

$$JKTCPZZ = JKACPZZ + JKEUPZZ$$

British Thermal Units (Btu)

Kerosene-type jet fuel has a heat content value of approximately 5.670 million Btu per barrel. This factor is applied to convert kerosene-type jet fuel from physical units to Btu:

$$\begin{aligned} JKACBZZ &= JKACPZZ * 5.670 \\ JKACBUS &= \Sigma JKACBZZ \\ JKEUBZZ &= JKEUPZZ * 5.670 \\ JKEUBUS &= \Sigma JKEUBZZ \\ JKTCBZZ &= JKTCPZZ * 5.670 \\ JKTCBUS &= \Sigma JKTCBZZ \end{aligned}$$

Additional Notes on Kerosene-Type Jet Fuel

1. An assumption is made that kerosene-type jet fuel use by the military in 1960 through 1983 is negligible. This assumption is based on product definitions from the American Petroleum Institute's *Standard Definitions for Petroleum Statistics*, Technical Report No. 1, Third Edition (1981), page 13, which states that kerosene-type jet fuel is used primarily by commercial aircraft engines.
2. Ethyl Corporation jet fuel sales to commercial users by State include some sales data that were improperly allocated between the States of Illinois and Indiana for 1960 through 1973. To adjust for this error, the average relative proportions of Illinois and Indiana sales from 1974 through 1978 were applied to the sum of the Illinois and Indiana sales in 1960 through 1973. From 1974 through 1983, sales data were correctly allocated.
3. Jet fuel sales in Illinois decreased sharply from 1984 forward, while sales in Indiana increased by about the same amount. It is possible that jet fuel for use at Chicago, Illinois, airports may have been purchased in Indiana. The same anomaly may have happened between New York and New Jersey beginning in 1981, when jet fuel for consumption at New York City airports may have been purchased in New Jersey. This is an inherent problem when using sales data as an indication of consumption, and no attempt has been made to adjust the numbers.
4. Prior to 1964, kerosene-type jet fuel was included in the total kerosene product supplied data in the source, the U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 2, "Salient Statistics of the Major Refined Petroleum Products in the United States." Table A3 summarizes the derivation of kerosene and jet fuel consumption estimates (columns 4 and 5) from data published in the source (columns 1, 2, and 3) for 1960 through 1963. For 1964 and years following, kerosene and kerosene-type jet fuel are reported separately in the source documents.
5. Kerosene-type jet fuel consumed by electric utilities, JKEUPZZ, is published in the EIA *Cost and Quality of Fuels for Electric Utility Plants*. These data are available for 1972 through 1982 only. Consumption

in all other years is assumed to be zero. State-level data for 1972 through 1974 are not available. The percentage of each State's consumption of the total U.S. consumption in 1975 was used to apportion the 1972 through 1974 national data to the States.

Data Sources for Kerosene-type Jet Fuel

JKEUPZZ — Kerosene-type jet fuel consumed by electric utilities by State.

- 1960 through 1971: No data available. Values are assumed to be zero.
- 1972 through 1974: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Fuel Oil and Kerosene," Table 15 footnote for U.S. value. These data were apportioned to the States by using the 1975 State proportions of the 1975 U.S. total from the source below.
- 1975 through 1979: Office of Electric Power Regulation, Federal Energy Regulatory Commission, *Annual Summary of Cost and Quality of Electric Utility Plant Fuels*, "Fuel Oil Deliveries for Combustion Turbine and Internal Combustion Units."
- 1980 through 1982: EIA, *Cost and Quality of Fuel for Electric Utility Plants*, Table 30.
- 1983 forward: Series discontinued; no data available. Values are assumed to be zero.

JKTTPZZ — Kerosene-type jet fuel total sold by State.

- 1960 through 1983: Ethyl Corporation, Petroleum Chemicals Division, *Yearly Report of Gasoline Sales by States*, "Aviation Turbine Fuel Sales."
- 1984 and 1985: EIA, *Petroleum Marketing Annual 1985*, Volume 2.
— 1984: Table A6.
— 1985: Table 34.
- 1986 through 1988: EIA, *Petroleum Marketing Annual*, Table 46.
- 1989 through 1993: EIA, *Petroleum Marketing Annual*, Table 48.
- 1994 forward: Unpublished data from Form EIA-782C, "Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption." Data published in thousand gallons per day in EIA, *Petroleum Marketing Annual*, Table 49 and on the EIA, *Energy InfoDisc* in the Oil and Gas Information System database. Withheld data were estimated by using averages of published months to fill in withheld

Table A3. Estimate of U.S. Consumption of Kerosene and Jet Fuel for 1960 through 1963
(Thousand barrels)

Year	(1) Kerosene Demand, Including Commercial Jet Fuel	(2) Jet Fuel Demand, Military Use Only	(3) Sales of Kerosene for Commercial Jet Fuel Use	(4) Estimated Kerosene Consumption (1) – (3)	(5) Estimated Total Jet Fuel Consumption (2) + (3)
1960	132,499	102,803	33,159	99,340	135,962
1961	144,435	104,436	47,187	97,248	151,623
1962	164,167	112,401	66,134	98,033	178,535
1963	172,212	115,237	75,236	96,976	190,473

months; subtracting published States from published PAD District totals; and assigning values based on previous years' quantities.

JKTCPUS — Kerosene-type jet fuel total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Naphtha-Type Jet Fuel

Physical Units

Two data series are used to estimate naphtha-type jet fuel consumption:

JNTCPUS = naphtha-type jet fuel total consumed, in thousand barrels;
and
JNMIPZZ = naphtha-type jet fuel issued to the military in each State,
in thousand barrels.

Total U.S. consumption of naphtha-type jet fuel, JNTCPUS, is the product supplied data series in the publication *Petroleum Supply Annual*, published by the Energy Information Administration (EIA).

Data on naphtha-type jet fuel issued to the military in each State, JNMIPZZ, are from the U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center.

The total U.S. military issues is the sum of the State data:

$$\text{JNMIPUS} = \sum \text{JNMIPZZ}$$

It is assumed that all naphtha-type jet fuel is used by military aircraft engines. (See the Additional Notes at the end of this section for the source reference for this assumption.) Therefore, an estimate of naphtha-type jet fuel consumption by State, JNTCPZZ, is calculated by assuming that each State consumes naphtha-type jet fuel in proportion to the amount issued to that State:

$$\text{JNTCPZZ} = (\text{JNMIPZZ} / \text{JNMIPUS}) * \text{JNTCPUS}$$

All naphtha-type jet fuel is assumed to be used for transportation purposes so the transportation consumption equals the estimated total consumption for each State and for the United States:

JNACPZZ = JNTCPZZ
JNACPUS = JNTCPUS

British Thermal Units (Btu)

Naphtha-type jet fuel has a heat content value of approximately 5.355 million Btu per barrel. This factor is applied to convert naphtha-type jet fuel from physical units to Btu:

JNTCBZZ = JNTCPZZ * 5.355
JNTCBUS = Σ JNTCBZZ
JNACBZZ = JNTCBZZ
JNACBUS = JNTCBUS

Additional Notes on Naphtha-Type Jet Fuel

1. An assumption was made that the naphtha-type jet fuel is for military use only. This assumption was based on product definitions from the American Petroleum Institute's *Standard Definitions for Petroleum Statistics*, Technical Report No. 1, Third Edition (1981), page 13, which states that naphtha-type jet fuel is used primarily by military aircraft engines.
2. Data on naphtha-type jet fuel issued to the military for each State (JNMIPZZ) are obtained from the U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center. There are no data available for 1960 through 1974, and the data available for 1975 and 1976 are not consistent; therefore, the 1977 values are used for 1960 through 1976 in CSEDS. The data are reported by fiscal year for 1977 through 1988 and are taken from the Defense Energy Information System. For 1989 and 1990, fiscal-year data from two databases, Defense Fuel Automated Management System and the Into-Plane Database, are summed. For 1991 and 1992, data from the same two databases, reported by calendar year, are used.

Data Sources for Naphtha-type Jet Fuel

JNMIPZZ — Naphtha-type jet fuel issued to the military in the United States.

- 1960 through 1974: No data are available. The 1977 data are used for each year.
- 1975 and 1976: No consistent data series are available. The 1977 data are used for both years.
- 1977 through 1987: The U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center, Defense Energy Information System, military retail issues based on fiscal year data. The District of Columbia issues are assumed to be zero; therefore, values reported for the District of Columbia are added to Maryland.
- 1988: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center, average of 1987 data (see source above) and 1989 data (see source below).
- 1989 and 1990: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center, Defense Fuel Automated Management System, military wholesale issues based on fiscal year data.
- 1991 through 1995, 1997: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center. State data for the calendar year from two databases are summed: Defense Fuel Automated Management System (military wholesale issues) and Into-Plane Database (military purchases from commercial airports). Into-plane values reported for the District of Columbia are added to Virginia.
- 1996: The data series for 1996 is temporarily unavailable. Simple averages of 1995 and 1997 State data are used to estimate 1996 values.

JNTCPUS — Naphtha-type jet fuel total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Jet Fuel Totals

Physical Unit

The following calculations are used to provide total jet fuel consumption estimates by end use in physical units:

$JFACPZZ = JKACPZZ + JNACPZZ$
 $JFACPUS = \Sigma JFACPZZ$
 $JFEUPZZ = JKEUPZZ$
 $JFEUPUS = JKEUPUS$
 $JFTCPZZ = JFACPZZ + JFEUPZZ$
 $JFTCPUS = \Sigma JFTCPZZ$

British Thermal Units (Btu)

The following calculations are used to provide total jet fuel consumption estimates by end use in Btu:

$JFACBZZ = JKACBZZ + JNACBZZ$
 $JFACBUS = \Sigma JFACBZZ$
 $JFEUBZZ = JKEUBZZ$
 $JFEUBUS = JKEUBUS$
 $JFTCBZZ = JFACBZZ + JFEUBZZ$
 $JFTCBUS = \Sigma JFTCBZZ$

Kerosene

Physical Units

Because State-level and end-use consumption data for kerosene are not available, four data series published by EIA representing sales of kerosene into or within each State are used to estimate kerosene consumption. The fifth data series, the U.S. total consumption, is the product supplied series from the EIA *Petroleum Supply Annual*. The sales series are used to apportion the known U.S. total consumption into State-level estimates of end-use consumption. The following variable names have been assigned to the five data series ("ZZ" in the variable names represents the two-letter State code that differs for each State):

$KSCMPZZ$ = kerosene sold to the commercial sector for heating, in thousand barrels;
 $KSIHPZZ$ = kerosene sold to the industrial sector for heating, in thousand barrels;
 $KSOTPPZZ$ =

kerosene sold for all other uses, including farm use, in thousand barrels;

$KSRSPZZ$ = kerosene sold to the residential sector for heating, in thousand barrels; and

$KSTCPUS$ = kerosene total consumed in the United States, in thousand barrels.

U.S. sales totals for each of the four State-level series are created by summing the State values.

The variables are combined as closely as possible into the major end-use sectors used in CSEDS. The residential and commercial sectors contain only $KSRSPZZ$ and $KSCMPZZ$, respectively.

The sales of kerosene to the industrial sector, $KSINPZZ$, for each State is the sum of kerosene sold for industrial space heating ($KSIHPZZ$) and kerosene sold for all other uses ($KSOTPPZZ$), including farm use. Sales of kerosene to the industrial sector are calculated:

$KSINPZZ = KSOTPPZZ + KSIHPZZ$
 $KSINPUS = \Sigma KSINPZZ$

Total sales of kerosene in each State is the sum of these three sectors' sales:

$KSTTPZZ = KSRSPZZ + KSCMPZZ + KSINPZZ$
 $KSTTPUS = \Sigma KSTTPZZ$

An estimate of each State's total consumption of kerosene is made by disaggregating the U.S. total consumption to the States in proportion to each State's sales share of the U.S. total sales:

$KSTCPZZ = (KSTTPZZ / KSTTPUS) * KSTCPUS$

Each State's residential sector sales percentage of total sales is applied to the State's estimated total consumption to create estimated residential sector consumption for the State, $KSRCPZZ$:

$KSRCPZZ = (KSRSPZZ / KSTTPZZ) * KSTCPZZ$

The commercial sector's estimated consumption in each State, $KSCCPZZ$, is calculated:

$$\text{KSCCPZZ} = (\text{KSCMPZZ} / \text{KSTTPZZ}) * \text{KSTCPZZ}$$

The industrial sector's estimated consumption in each State, KSICPZZ, is calculated:

$$\text{KSICPZZ} = (\text{KSINPZZ} / \text{KSTTPZZ}) * \text{KSTCPZZ}$$

U.S. totals for the three sectors' consumption estimates are the sums of the States' estimated consumption.

British Thermal Units (Btu)

Kerosene has a heat content value of approximately 5.670 million Btu per barrel. This factor is applied to convert kerosene estimated consumption from physical units to Btu:

$$\text{KSRCBZZ} = \text{KSRCPZZ} * 5.670$$

$$\text{KSCCBZZ} = \text{KSCCPZZ} * 5.670$$

$$\text{KSICBZZ} = \text{KSICPZZ} * 5.670$$

$$\text{KSTCBZZ} = \text{KSRCBZZ} + \text{KSCCBZZ} + \text{KSICBZZ}$$

The U.S. Btu consumption estimates for the three consuming sectors and the U.S. total are calculated as the sum of the State-level data.

Additional Notes on Kerosene

1. See Note 4 at the end of the "Kerosene-Type Jet Fuel" section on page 369 for comments concerning the inclusion of kerosene-type jet fuel with the kerosene total product supplied prior to 1964 in the source documents.
2. "Sales" data are actually called "shipments" in the source documents for 1960 and 1961; "consumption" for 1962 through 1966; "shipments" for 1967; "sales" from 1968 through 1978; "deliveries" for 1979 through 1983; and "sales" for 1984 forward.
3. In 1979, the Energy Information Administration (EIA) implemented a new survey form, EIA-172, to obtain deliveries of fuel oil and kerosene data and updated the list of respondents. (A detailed explanation is published in the *Energy Data Report* "Deliveries of Fuel Oil and

Kerosene in 1979.") In the new survey form, certain end-use categories were redefined—in many cases, to collect more disaggregated data. The reclassifications resulted in some end-use categories that were no longer comparable with those in previous surveys. Where discontinuities occurred, estimates for the pre-1979 years have been made in CSEDS to conform with the 1979 kerosene deliveries classifications. The pre-1979 deliveries estimates are not published in this report but are used in CSEDS to disaggregate the known U.S. total product supplied (consumption) into State and major end-use sector consumption estimates.

For kerosene deliveries in 1979, the end-use categories called "residential," "commercial," and "industrial" are available. The pre-1979 deliveries category called "heating" is related to the sum of "residential," "commercial," and "industrial" in 1979. Therefore, the following method was applied to present a comparable series for kerosene delivered to the residential, commercial, and industrial sectors:

- A 1979 subtotal for heating was created by summing each State's residential, commercial, and industrial deliveries categories, thereby creating a comparable deliveries subtotal for all years.
- Residential, commercial, and industrial shares of the heating subtotal in 1979 were calculated for each State.
- These 1979 end-use shares were then applied to each pre-1979 heating subtotal in each State to create State estimates of end-use deliveries for 1960 through 1978.

The 1980 through 1982 kerosene deliveries data are based on the same survey as that used for 1979; therefore, the 1980 through 1982 data are directly comparable to 1979 data.

In 1984, EIA again updated the list of respondents for this survey, and the Form EIA-172 became the Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report." EIA did not conduct a fuel oil and kerosene sales survey for 1983. The 1983 estimates in CSEDS are based on 1984 data obtained from the Form EIA-821. Statistical procedures and methodologies used for the Form EIA-821 differ from those used in previous years. Therefore, the 1983 and forward sales

data may not be directly comparable to the pre-1983 data. (In the source document, the sales data for 1983 forward are reported in thousand gallons. These data were first converted to thousand barrels before being entered into CSEDS.)

4. In 1975 through 1977, the industrial sector consumption of kerosene includes small quantities of kerosene-type jet fuel that were produced as jet fuel and sold as kerosene.

Data Sources for Kerosene

KSCMPZZ — Kerosene sold to the commercial sector for heating.

- 1960 through 1978: EIA estimates based on statistics of commercial sector deliveries of kerosene from the EIA, *Energy Data Report*, “Deliveries of Fuel Oil and Kerosene, in 1979,” Table 3. State ratios based on 1979 commercial sector deliveries were applied to each State’s heating deliveries category from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 373.)
- 1979 and 1980: EIA, *Energy Data Report*, “Deliveries of Fuel Oil and Kerosene,” Table 3.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 6.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A14.
 - 1984: July 1986 issue, Table A4.
 - 1985 and 1986: July 1987 issue, Table A6.
 - 1987: June 1988 issue, Table A6.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 6.

KSIHPZZ — Kerosene sold to the industrial sector for heating.

- 1960 through 1978: EIA estimates based on statistics of industrial sector deliveries of kerosene from the EIA, *Energy Data Report*, “Deliveries of Fuel Oil and Kerosene in 1979,” Table 3. State ratios based on 1979 industrial sector deliveries were applied to each State’s

heating deliveries category from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 373.)

- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 3.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 6.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A14.
 - 1984: July 1986 issue, Table A4.
 - 1985 and 1986: July 1987 issue, Table A6.
 - 1987: June 1988 issue, Table A6.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 6.

KSOTPZZ — Kerosene sold for all other uses, including farm use.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:
 - 1960 and 1961: Table 10.
 - 1962 and 1963: Table 9.
 - 1964 and 1965: Table 8.
 - 1966 through 1975: Table 5.
- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 5.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene.” Calculated as the sum of kerosene delivered for farm and other use from Table 3.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 6.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A14.
 - 1984: July 1986 issue, Table A4.
 - 1985 and 1986: July 1987 issue, Table A6.
 - 1987: June 1988 issue, Table A6.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 6.

KSRSPZZ — Kerosene sold to the residential sector for heating.

- 1960 through 1978: EIA, *Energy Data Report* “Deliveries of Fuel Oil and Kerosene in 1979,” Table 3. State ratios based on 1979 residential sector deliveries were applied to each State’s heating deliveries category from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 373.)
- 1979 and 1980: EIA, *Energy Data Report*, “Deliveries of Fuel Oil and Kerosene,” Table 3.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 6.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A14.
 - 1984: July 1986 issue, Table A4.
 - 1985 and 1986: July 1987 issue, Table A6.
 - 1987: June 1988 issue, Table A6.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 6.

KSTCPUS — Kerosene total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Liquefied Petroleum Gases

Liquefied petroleum gases (LPG) in CSEDS include: ethane (including ethylene), propane (including propylene), normal butane (including butylene), butane-propane mixtures, ethane-propane mixtures, and isobutane.

Physical Units

The following data series used in CSEDS to estimate LPG consumption represent sales or estimated sales by State in thousand gallons.

LGCBMZZ = LPG sold for internal combustion engine fuel use. Included are sales for use in all kinds of highway vehicles, forklifts, industrial tractors, and for use in oil field drilling and production;

LGHCMZZ = LPG sold for residential and commercial use. Included are sales for nonfarm private households for space heating, cooking, water heating, and other household uses, such as clothes drying and incineration. Also included are sales to nonmanufacturing organizations, such as motels, restaurants, retail stores, laundries, and other service enterprises, primarily for use in space heating, water heating, and cooking; and

LGTTPZZ = LPG total sales for all uses.

Total U.S. consumption of LPG is the product supplied data series in the publication *Petroleum Supply Annual*, published by the Energy Information Administration (EIA):

LGTCBUS = LPG total consumed in the United States, in thousand barrels.

Another variable is used in CSEDS to estimate LPG consumption by the transportation sector. It is described in detail in Note 2 on page 376.

LGTRSUS = the transportation sector share of LPG internal combustion engine sales.

Since the LPG sales data are in gallons, they must be converted to barrels (42 U.S. gallons per U.S. barrel) to be comparable to total consumption estimates. The formulas for calculating State sales data are:

LGCBPZZ = LGCBMZZ / 42

LGHCPZZ = LGHCMZZ / 42

The U.S. totals for each of the State-level LPG sales data series are calculated as the sum of the State values.

An assumption is made that 85 percent of the LPG sold for residential and commercial use (LGHCPCZZ) is sold to the residential sector (LGRCPZZ), and 15 percent is sold to the commercial sector (LGCCPZZ) for all States and years. (See Note 3 on page 377.) It is also assumed that LPG sales to the residential and commercial sectors are equal to the consumption in those sectors. The formulas used are:

$$\begin{aligned}\text{LGRCPZZ} &= \text{LGHCPCZZ} * 0.85 \\ \text{LGCCPZZ} &= \text{LGHCPCZZ} * 0.15\end{aligned}$$

The LPG consumption by the transportation sector is estimated to be the transportation share of the sales for internal combustion engine fuel:

$$\text{LGACPZZ} = \text{LGCBPZZ} * \text{LGTRSUS}$$

An estimate of each State's total LPG consumption (LGTCPCZZ) is made by allocating the U.S. total consumption to the States in proportion to each State's sales share of the U.S. total sales:

$$\text{LGTCPCZZ} = (\text{LGTPPZZ} / \text{LGTPPUS}) * \text{LGTCPCUS}$$

The industrial (LGICPZZ) sector consumption of each State is the difference between the State's total LPG consumption and the sum of its residential, commercial, and transportation sectors' consumption:

$$\text{LGICPZZ} = \text{LGTCPCZZ} - (\text{LGRCPZZ} + \text{LGCCPZZ} + \text{LGACPZZ})$$

U.S. totals for the four end-use sector consumption estimates are calculated as the sums of the State estimates.

British Thermal Units (Btu)

The factor for converting LPG from physical unit values to British thermal units, LGTCCKUS, is calculated annually for 1967 forward by EIA as a weighted average by multiplying the quantity consumed of each of the component products (ethane, propane, butane, butane-propane, ethane-propane, and isobutane) by each product's conversion factor (listed in Appendix C, Thermal Conversion Factor Source Documentation) and dividing the sum of those heat contents by the sum of the quantities consumed. The consumption of each product is taken from the product supplied data series in the *Energy Data Report*, "Petroleum Statement, Annual" (1967

through 1980), and the *Petroleum Supply Annual* (1981 forward), published by EIA. For 1960 through 1966, EIA adopted the Bureau of Mines thermal conversion factor of 4.011 million Btu per barrel as published in the *Mineral Industry Surveys*, "Crude Petroleum and Petroleum Products, 1956," Table 4 footnote.

This factor is used to estimate consumption in Btu for all States and end uses:

$$\begin{aligned}\text{LGRCBZZ} &= \text{LGRCPZZ} * \text{LGTCCKUS} \\ \text{LGCCBZZ} &= \text{LGCCPZZ} * \text{LGTCCKUS} \\ \text{LGICBZZ} &= \text{LGICPZZ} * \text{LGTCCKUS} \\ \text{LGACBZZ} &= \text{LGACPZZ} * \text{LGTCCKUS}\end{aligned}$$

Total estimated consumption of LPG in Btu is the sum of the end-use consumption estimates:

$$\text{LGTCBZZ} = \text{LGRCBZZ} + \text{LGCCBZZ} + \text{LGICBZZ} + \text{LGACBZZ}$$

The U.S. Btu consumption estimates for the four sectors and total LPG are calculated as the sum of the State data.

Additional Notes on Liquefied Petroleum Gases

1. Sales data for Maryland and the District of Columbia are combined in the source documents. Sales data are published in six categories. The percentages shown in Table A4 are applied to disaggregate the combined State data in each of the sectors for all years.
2. The sales of LPG for internal combustion engine fuel use are divided between the transportation sector and the industrial sector by using LGTRSUS, the transportation sector's share of internal combustion engine use. LGTRSUS is estimated from data on "special fuels used on highways," a category that includes only LPG and diesel fuel. The special fuels data are published by the U.S. Department of Transportation, Federal Highway Administration (see MGSFPZZ on page 384). The quantity of LPG included in special fuels is estimated each year (the LPG portion ranges from 8.4 percent in 1960 to 1.2 percent in 1990). LGTRSUS is then derived by dividing the quantity of LPG included in special fuels used on highways by the quantity of LPG sold for internal combustion engine use. This U.S. factor is

Table A4. Percentages Used to Disaggregate Maryland and D.C. Combined LPG Sales Data

Sales Category	Maryland	D.C.
Residential and Commercial	99.9%	0.1%
Internal combustion engine fuel	98.9	1.1
Industrial	99.4	0.6
Chemical	100.0	0.0
Utility gas	100.0	0.0
Miscellaneous	100.0	0.0

applied to each of the States. LGTRSUS values are shown in Table A5.

- Little information exists for allocating the residential and commercial use of LPG to the individual sectors. CSEDS applies an 85 percent residential and 15 percent commercial split for all States and years based on figures published in the Federal Energy Administration

Table A5. Transportation Sector Share of LPG Internal Combustion Engine Use, 1960 Forward

Year	LGTRSUS	Year	LGTRSUS	Year	LGTRSUS
1960	0.229	1973	0.384	1986	0.456
1961	0.258	1974	0.381	1987	0.375
1962	0.266	1975	0.406	1988	0.437
1963	0.273	1976	0.440	1989	0.428
1964	0.259	1977	0.478	1990	0.471
1965	0.290	1978	0.594	1991	0.426
1966	0.325	1979	0.536	1992	0.425
1967	0.368	1980	0.380	1993	0.443
1968	0.389	1981	0.671	1994	0.734
1969	0.341	1982	0.579	1995	0.416
1970	0.363	1983	0.578	1996	0.357
1971	0.423	1984	0.631	1997	0.325
1972	0.392	1985	0.440		

Project Independence Blueprint Task Force Report, "Residential and Commercial Energy Use Patterns, 1970-1990," November 1974, Table 1.A.1.

- LPG sales data by State and end-use categories for 1960 through 1982 are from EIA's "Sales of Liquefied Petroleum Gases and Ethane." In 1979, EIA modified the LPG sales survey, Form EIA-174, and changed the list of respondents. Because of the updated sampling frame, the 1979 through 1982 sales data may not be directly comparable to the pre-1979 sales when a different estimation procedure was used. Explanation of the discontinuities caused by the change in the 1979 sampling frame are provided in EIA's *Energy Data Report*, "Sales of Liquefied Petroleum Gases and Ethane in 1979."

Because of the change in survey techniques used for measuring LPG sales, many States' data were withheld from publication in the 1979 through 1982 LPG sales reports to avoid disclosure of company-level data. The consumption estimates in CSEDS use all data published in the 1979 through 1982 LPG sales reports and estimates prepared by EIA's Office of Oil and Gas for data that were withheld from publication. (See Note 5 below for estimation procedures.)

Some end-use categories changed in 1979 due to redefinition of the classifications. One of these changes, for example, occurred with LPG sold to farms for household heating and cooking. Prior to 1979 these sales were reported as part of the residential and commercial category, while in 1979 they were counted in the farm use category that goes into the industrial sector in CSEDS. No attempt has been made to adjust for this type of inconsistency.

The Form EIA-174 was cancelled after collection of 1982 data. The 1983 LPG consumption estimates are based on the assumption that LPG end-use sector demand in 1983 occurred in the same proportion as 1982 sector demand within each State; i.e., the 1983 LPG product supplied figure was allocated to the States by using the distribution of volumes consumed for 1982.

- The following procedures were used to estimate the State end-use sales that were withheld from publication in the 1979-1982 LPG sales reports:

- For each year, missing State total sales were estimated by allocating the sum of the missing State sales within each Petroleum Administration for Defense (PAD) District to the individual States, in proportion to the sum of the known end-use sales for those States.
 - Missing PAD District end-use totals for 1979 and 1980 were obtained by using the 1980 and 1981 sales reports. Missing PAD District chemical sales were estimated by allocating the total missing volume of chemical sales to the PAD District in proportion to the number of chemical plants in each PAD District. The remaining PAD District end-use totals were obtained by subtraction. For 1981 and 1982, no PAD District estimations were necessary because all PAD District end-use totals are known.
 - The published data and the estimated State and PAD District end-use totals were used to estimate missing State end-use sales volumes within a PAD District: missing State end-use sector values were estimated by allocating the missing volume for the State approximately proportional to the PAD District end-use sector totals.
6. Prior to 1979, State data for chemical use of LPG were withheld from publication, although they were included in the U.S. total in the tables in EIA's "Sales of Liquefied Petroleum Gases and Ethane" reports. Beginning in 1979, State-level chemical use data were published in the LPG sales reports, but data for several States were withheld. Estimates for the withheld data for chemical use sales for 1979 and 1980 were created by using the estimation procedure described in Note 5 above. Then the published and the estimated State data for 1979 were used to create State shares of the total U.S. chemical use sales. These percentage shares (shown in Table A6) were applied to the total U.S. LPG chemical use sales in 1960 through 1978 to create State chemical use estimates. The chemical use estimates were added to the States' total LPG sales series, LGTTPZZ.
7. Beginning in 1984, the American Petroleum Institute (API), the Gas Processors Association, and the National LP-Gas Association jointly sponsored an LPG sales survey. The results are published in the

Table A6. State Shares of the Total U.S. LPG Sold for Chemical Use, 1960 Through 1978

State	Percent	State	Percent
Alabama	0.000	Montana	0.000
Alaska	0.589	Nebraska	0.000
Arizona	0.000	Nevada	0.000
Arkansas	0.000	New Hampshire	0.000
California	2.667	New Jersey	2.040
Colorado	0.232	New Mexico	0.603
Connecticut	0.053	New York	0.000
Delaware	0.811	North Carolina	0.327
District of Columbia	0.000	North Dakota	0.000
Florida	0.000	Ohio	1.103
Georgia	0.699	Oklahoma	0.309
Hawaii	0.000	Oregon	0.000
Idaho	0.000	Pennsylvania	0.354
Illinois	7.066	Rhode Island	0.000
Indiana	0.243	South Carolina	0.021
Iowa	0.900	South Dakota	0.000
Kansas	0.451	Tennessee	0.000
Kentucky	2.548	Texas	57.425
Louisiana	20.566	Utah	0.000
Maine	0.012	Vermont	0.000
Maryland	0.050	Virginia	0.025
Massachusetts	0.009	Washington	0.000
Michigan	0.151	West Virginia	0.286
Minnesota	0.000	Wisconsin	0.000
Mississippi	0.315	Wyoming	0.091
Missouri	0.054	United States	100.000

API's report *Sales of Natural Gas Liquids and Liquefied Refinery Gases*. These data include sales of pentanes plus; the pentanes plus data were removed prior to use in CSEDS.

The API report publishes total LPG sales for Alaska and Hawaii, but disaggregated data for those States are withheld. EIA estimates the

withheld data for the “Residential and Commercial” and the “Internal Combustion Fuel” columns as follows:

- Alaska and Hawaii are the only States of the seven States in PAD District V for which data are withheld. Therefore, subtracting the available data for the other five States from the PAD District V total gives the withheld data for Alaska and Hawaii combined.
- The withheld data are assigned to Alaska and Hawaii in proportion to each State’s share of their combined published total sales.

Data Sources for Liquefied Petroleum Gases

LGCBMZZ — LPG sold for internal combustion engine use by State.

Note: Data for Maryland and the District of Columbia were combined for all years. The method for disaggregating the data is explained in Note 1, on page 376.

- 1960 through 1967: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Liquefied Petroleum Gases and Ethane.” The specific tables are:
 - 1960 and 1961: Table 5 (data called “Shipments”).
 - 1962 through 1966: Table 2 (data called “Consumption”).
 - 1967: Table 2 (data called “Shipments”).
- 1968 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 2.
- 1976 through 1980: EIA, *Energy Data Reports*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 3.
- 1983: EIA estimates.

Note: For 1984 forward, some data are adjusted and estimated by EIA. (See explanation in Note 7, on page 378.)

- 1984 through 1988: American Petroleum Institute, *1990 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 24 through 33.
- 1989 through 1991: American Petroleum Institute, *1992 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 4, 5, 18, and 19.

- 1992 forward: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table 3. Final data for each year is published in the report for the next year.

LGHCMZZ — LPG sold for residential and commercial use by State.

Note: Data for Maryland and the District of Columbia were combined for all years. The method for disaggregating the data is explained in Note 1, on page 376.

- 1960 through 1967: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Liquefied Petroleum Gases and Ethane.” The specific tables are:
 - 1960 and 1961: Table 5 (data called “Shipments”).
 - 1962 through 1966: Table 2 (data called “Consumption”).
 - 1967: Table 2 (data called “Shipments”).
- 1968 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 2.
- 1976 through 1980: EIA, *Energy Data Reports*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 3.
- 1983: EIA estimates.

Note: For 1984 forward, some data are adjusted and estimated by EIA. (See explanation in Note 7, on page 378.)

- 1984 through 1988: American Petroleum Institute, *1990 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 24 through 33.
- 1989 through 1991: American Petroleum Institute, *1992 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 4, 5, 18, and 19.
- 1992 forward: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table 3. Final data for each year is published in the report for the next year.

LGTCUKS — Factor for converting LPG from physical units to Btu.

- 1960 through 1966: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Crude Petroleum and Petroleum Products, 1956,” Table 4 footnote, constant value of 4.011 million Btu per barrel.
- 1967 forward: Calculated annually by EIA as a weighted average by multiplying the quantity consumed of each of the component products by each product’s conversion factor (given with source references

in Appendix C) and dividing the sum of those heat contents by the sum of the quantities consumed. The component products are ethane (including ethylene), propane (including propylene), normal butane (including butylene), butane-propane mixtures, ethane-propane mixtures, and isobutane. Quantities consumed are from:

- 1967 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

LGTCPU — LPG total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

LGTRSUS — The transportation sector share of LPG internal combustion engine sales.

- EIA estimates based on the LPG portion of the special fuels used on highways published by the U.S. Department of Transportation, Federal Highway Administration (variable MGSFPUS in CSEDS), as a percentage of the LPG sold for internal combustion engine use published by the American Petroleum Institute (variable LGCBMUS in CSEDS). For an explanation of the estimation method, see Note 2, on page 376.

LGTTTPZZ — LPG total sales for all uses by State.

Note: Data for Maryland and the District of Columbia were combined for all years. The method for disaggregating the data is explained in Note 1, on page 376.

- 1960 through 1967: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Liquefied Petroleum Gases and Ethane.” The specific tables are:
 - 1960 and 1961: Table 5 (data called “Shipments”).
 - 1962 through 1966: Table 2 (data called “Consumption”).
 - 1967: Table 2 (data called “Shipments”).
- 1968 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 2.

- 1976 through 1980: EIA, *Energy Data Reports*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, “Sales of Liquefied Petroleum Gases and Ethane,” Table 3.
- 1983: EIA estimates.

Note: For 1984 forward, some data are adjusted and estimated by EIA. (See explanation in Note 7, on page 378.)

- 1984 through 1988: American Petroleum Institute, *1990 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 24 through 33.
- 1989 through 1991: American Petroleum Institute, *1992 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 4, 5, 18, and 19.
- 1992 forward: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table 3. Final data for each year are published in the report for the next year.

Lubricants

Physical Units

Three data series are used to estimate State consumption of lubricants. The two State-level sales data series are used to apportion the U.S. total consumption data to the States and the end-use sectors within the States. “ZZ” in the variable names represents the two-letter State code that differs for each State:

- LUINPZZ = lubricants sold to the industrial sector, in thousand barrels;
- LUTRPZZ = lubricants sold to the transportation sector, in thousand barrels; and
- LUTCPUS = lubricants total consumed in the United States, in thousand barrels.

Data for the first two variables are developed from the Bureau of the Census reports “Sales of Lubricating and Industrial Oils and Greases” in the *Current Industrial Reports* series. These series were discontinued in 1977 and the method of estimation for 1978 forward is explained in Note 1 at the end of this “Lubricants” section. The third variable for lubricants is the product supplied data series in the publication *Petroleum Supply Annual*, published by the Energy Information Administration (EIA). The first two

variables are used for apportioning the third into State total consumption and State end-use consumption estimates by using the following calculations.

Total sales of lubricants for each State, LUTTPZZ, is created by adding the industrial and transportation sales:

$$\text{LUTTPZZ} = \text{LUINPZZ} + \text{LUTRPZZ}$$

U.S. sales totals are calculated by summing the State sales data.

Each State's proportion of total U.S. sales is used to calculate each State's estimated consumption of lubricants:

$$\text{LUTCPZZ} = (\text{LUTTPZZ} / \text{LUTTPUS}) * \text{LUTCPUS}$$

Each State's estimated total consumption of lubricants is further divided into end-use estimates in proportion to that State's sales by sector as a portion of total sales in the State. Lubricants consumed by State for industrial use, LUICPZZ, and for transportation use, LUACPZZ, are calculated:

$$\begin{aligned}\text{LUICPZZ} &= (\text{LUINPZZ} / \text{LUTTPZZ}) * \text{LUTCPZZ} \\ \text{LUACPZZ} &= (\text{LUTRPZZ} / \text{LUTTPZZ}) * \text{LUTCPZZ}\end{aligned}$$

The consumption of lubricants in the United States by these two end-use sectors is created by summing the State estimates.

British Thermal Units (Btu)

Lubricants have a heat content value of approximately 6.065 million Btu per barrel. This factor is applied to convert lubricants estimated consumption from physical units to Btu:

$$\begin{aligned}\text{LUICBZZ} &= \text{LUICPZZ} * 6.065 \\ \text{LUACBZZ} &= \text{LUACPZZ} * 6.065\end{aligned}$$

The State total consumption in Btu is the sum of the two sectors' consumption in Btu:

$$\text{LUTCBZZ} = \text{LUICBZZ} + \text{LUACBZZ}$$

The U.S. sector and total consumption estimates in Btu are calculated as the sum of the State data.

Additional Notes on Lubricants

1. The lubricants sales data (LUINPZZ and LUTRPZZ) were published approximately every other year by the Bureau of the Census until the discontinuation of the series after 1977. Each year's sales data have been used to calculate that year's and at least one other year's consumption estimates. Table A7 specifies which years of consumption estimates depend on which years of the sales data.
2. The sales data from the source document for LUINPZZ and LUTRPZZ are available in incompatible units. The industrial series, LUINPZZ, is oils and greases sold for industrial lubricating and other uses measured in thousand gallons. The transportation series, LUTRPZZ, is oils and greases sold for automotive and aviation uses measured in thousand pounds. Prior to use in CSEDS, these were converted to thousand barrels by dividing the oil data by 42 gallons per barrel and dividing the greases data by 300 pounds per barrel. In the source document, some State data are not published to avoid disclosing figures for individual companies. The undisclosed data were entered as zero in CSEDS.

Data Sources for Lubricants

LUINPZZ — Lubricants sold to the industrial sector by State. Calculated from:

- U.S. Department of Commerce, Bureau of the Census, *Current Industrial Reports*, "Sales of Lubricating and Industrial Oils and Greases," for 1960, 1962, 1965, 1967, 1969, 1971, 1973, 1975, and 1977. (See explanation in Notes 1 and 2 above.)

LUTCPUS — Lubricants total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

LUTRPZZ — Lubricants sold to the transportation sector by State. Calculated from:

- U.S. Department of Commerce, Bureau of the Census, *Current Industrial Reports*, “Sales of Lubricating and Industrial Oils and Greases,” for 1960, 1962, 1965, 1967, 1969, 1971, 1973, 1975, and 1977. (See explanation in Notes 1 and 2 on page 381.)

Motor Gasoline

Physical Units

Nine data series are used to estimate the State end-use consumption of motor gasoline. Eight of the series are from the U.S. Department of Transportation, Federal Highway Administration publication, *Highway Statistics*, and represent sales of motor gasoline. The sales data are categorized as sales for highway and nonhighway use:

- Highway Use** sales data (MGMFP) are from the *Highway Statistics* Table MF-21; however, they are reduced by the amount of highway “special fuels” (MGSFP) used in each State each year as reported on Table MF-25 (prior to 1994) and Table MF-21 (1994 forward). Special fuels are primarily diesel fuels, not motor gasoline, and are included in the transportation sector of distillate fuel.
- Nonhighway Use** sales are further subdivided into sales for: (1) public use by States, counties, and municipalities (MGPNP) from Table MF-21, and (2) private and commercial use as reported on MF-24. The private and commercial nonhighway use of motor gasoline has the following components: agricultural use (MGAGP), industrial and commercial use (MGIYP), construction use (MGCUP), marine use (MGMRP), and miscellaneous and unclassified uses (MGMSPP). Another component of the private and commercial nonhighway series is aviation gasoline (AVNMM), which is discussed under the “Aviation Gasoline” section of this documentation.

The ninth motor gasoline data series (MGTCPUS) is the total U.S. consumption of motor gasoline published in the product supplied series in the EIA publication *Petroleum Supply Annual*.

The nine motor gasoline data series are (“ZZ” in the variable names represent the two-letter State code that differs for each State):

MGAGPZZ	= motor gasoline sold for agricultural use in each State, in thousand gallons;
MGCUPZZ	= motor gasoline sold for construction use in each State, in thousand gallons;
MGIYPZZ	= motor gasoline sold for industrial and commercial use in each State, in thousand gallons;
MGMFPZZ	= motor fuel sold for highway use in each State, in thousand gallons;
MGMRPZZ	= motor gasoline sold for marine use in each State, in thousand gallons;
MGMSPPZZ	= motor gasoline sold for miscellaneous and unclassified uses in each State, in thousand gallons;
MGPNPZZ	= motor fuel sold for public nonhighway use in each State, in thousand gallons;
MGSFPZZ	= special fuels (primarily diesel fuel with small amounts of liquefied petroleum gases) sold in each State, in thousand gallons; and
MGTCPUS	= motor gasoline total consumed in the United States, in thousand barrels.

Table A7. Lubricants Sales Data Used in Consumption Estimates

Year of Sales Data	Year of Consumption Estimates
1960	1960 and 1961
1962	1962, 1963, and 1964
1965	1965 and 1966
1967	1967 and 1968
1969	1969 and 1970
1971	1971 and 1972
1973	1973 and 1974
1975	1975 and 1976
1977	1977 forward

U.S. totals for the eight State series named above are calculated as the sum of the State data.

The transportation sector accounts for most of the motor gasoline sales. Sales to the transportation sector is estimated to be the sum of motor fuel sales for marine use and for highway use (minus the sales of special fuels, which are primarily diesel fuels and are accounted for in the transportation sector of distillate fuel). Sales of motor gasoline to the transportation sector in each State (MGTRPZZ) is calculated:

$$\text{MGTRPZZ} = \text{MGMFPZZ} + \text{MGMRPZZ} - \text{MGSFPZZ}$$

Two sales data series are added to estimate motor gasoline sales to the commercial sector: miscellaneous (including unclassified) and public non-highway sales. Sales of motor gasoline to the commercial sector in each State (MGCMPZZ) is calculated:

$$\text{MGCMPZZ} = \text{MGMSPPZZ} + \text{MGPNPZZ}$$

Sales of motor gasoline for use in the industrial sector in each State (MGINPZZ) is calculated as the sum of the sales for agricultural use, for construction use, and for industrial and commercial use:

$$\text{MGINPZZ} = \text{MGAGPZZ} + \text{MGCUPZZ} + \text{MGIYPZZ}$$

Total sales of motor gasoline in each State (MGTPPZZ) is calculated as the sum of the sales to the major sectors:

$$\text{MGTPPZZ} = \text{MGCMPZZ} + \text{MGINPZZ} + \text{MGTRPZZ}$$

U.S. totals for the three end-use sectors' sales and for total sales are calculated as the sum of the States' sales.

The motor gasoline sales data for the three end-use sectors in each State are used to apportion the U.S. total consumption of motor gasoline to the States and to the major end-use sectors within each State.

The estimated consumption of motor gasoline in each State is calculated according to each State's share of the total sales. Estimated consumption of motor gasoline in each State (MGTCPZZ) is calculated:

$$\text{MGTCPZZ} = (\text{MGTPPZZ} / \text{MGTPPUS}) * \text{MGTCPUS}$$

The commercial sector estimated consumption of motor gasoline (MGCCPZZ) is calculated:

$$\text{MGCCPZZ} = (\text{MGCMPZZ} / \text{MGTPPZZ}) * \text{MGTCPZZ}$$

The industrial sector estimated consumption (MGICPZZ) is calculated:

$$\text{MGICPZZ} = (\text{MGINPZZ} / \text{MGTPPZZ}) * \text{MGTCPZZ}$$

The transportation sector estimated consumption (MGACPZZ) is calculated:

$$\text{MGACPZZ} = (\text{MGTRPZZ} / \text{MGTPPZZ}) * \text{MGTCPZZ}$$

The consumption of motor gasoline by major end-use sector in the United States is estimated by summing the States' estimated consumption.

British Thermal Units (Btu)

Motor gasoline has a heat content value of approximately 5.253 million Btu per barrel. This factor is applied to convert motor gasoline estimated consumption from physical units to Btu:

$$\text{MGCCBZZ} = \text{MGCCPZZ} * 5.253$$

$$\text{MGICBZZ} = \text{MGICPZZ} * 5.253$$

$$\text{MGACBZZ} = \text{MGACPZZ} * 5.253$$

$$\text{MGTCBZZ} = \text{MGCCBZZ} + \text{MGICBZZ} + \text{MGACBZZ}$$

The U.S. level Btu consumption estimates are calculated by summing the State data.

Data Sources for Motor Gasoline

MGAGPZZ — Motor gasoline sold for agricultural use by State.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.

- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table G-24 in 1965 and Table MF-24 in 1966 forward.

MGCUPZZ — Motor gasoline sold for construction use by State.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table G-24 in 1965 and Table MF-24 in 1966 forward.

MGIYPZZ — Motor gasoline sold for industrial and commercial use by State.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table G-24 in 1965 and Table MF-24 in 1966 forward.

MGMFPZZ — Motor fuel sold for highway use by State.

- 1960 through 1995: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, Table MF-221 gives revised U.S. totals. State revisions can be calculated by adding data from Tables MF-225 and MF-226.
- 1996 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table MF-21.

MGMRPZZ — Motor gasoline sold for marine use by State.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table G-24 in 1965 and Table MF-24 in 1966 forward.

MGMSPZZ — Motor gasoline sold for miscellaneous uses by State.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24. Sum of the “Miscellaneous” column plus the “Unclassified” column minus the “Total Classified” column.

- 1965: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table G-24. Sum of the “Miscellaneous” column plus the “Unclassified” column minus the “Total Classified” column.
- 1966 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table MF-24. The specific columns are:
 - 1966 through 1981: Sum of the “Miscellaneous” and “Unclassified” columns.
 - 1982 forward: The “Miscellaneous” column.

MGPNPZZ — Motor fuel sold for public nonhighway use by State.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-21.
- 1985, 1987, and 1992: Unpublished revised State data comparable to the U.S. values published in *Highway Statistics Summary to 1995*, Table 221.
- 1965 through 1984, 1986, 1988 through 1991, and 1993 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table G-21 in 1965 and Table MF-21 in 1966 forward.

MGSFPZZ — Motor gasoline special fuels sales by State (primarily diesel fuel with small amounts of liquefied petroleum gases).

- 1960 through 1995: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics, Summary to 1995*, Table MF-225.
- 1996 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table MF-21.

MGTCPUS — Motor gasoline total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. “Petroleum Statement, Annual,” Table 1.
For 1960 through 1963, motor gasoline was combined with aviation gasoline and published as “gasoline” in the source table. Table 19 in the “Petroleum Statement, Annual” titled “Salient Statistics of Aviation Gasoline” provided separate data for aviation gasoline for those years. The aviation gasoline data from the second table were subtracted from the gasoline data in the first table to derive the motor gasoline consumption series used in CSEDs.

- 1976 through 1980: EIA, *Energy Data Reports*. “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Petroleum Coke

Physical Units

Five data series are used to estimate the consumption of petroleum coke. Three are measures of petroleum coke consumption and two are indicators of industrial activity used to apportion U.S. consumption to the States. “ZZ” in the variable name represents the two-letter State code that differs for each State:

PCTCPUS	= petroleum coke total consumed in the United States (electric utility and industrial sectors), in thousand barrels;
PCEUMZZ	= petroleum coke consumed by electric utilities in each State, in thousand short tons;
PCRFPUS	= petroleum coke used at refineries as both catalytic and marketable coke in the United States, in thousand barrels;
CTCAPZZ	= catalytic cracking charge capacity of petroleum refineries in each State, in barrels per calendar day (1960 through 1979) and barrels per stream day (1980 forward); and
AICAPZZ	= aluminum ingot production capacity in each State, in short tons.

The total consumption of petroleum coke in the United States (PCTCPUS) is the product supplied series from the EIA publication *Petroleum Supply Annual*.

Petroleum coke consumed at electric utilities, PCEUMZZ, is available from 1970 forward from the Energy Information Administration (EIA), Form EIA-759, “Monthly Power Plant Report,” and predecessor forms. Prior to 1970, no data are available for this series and zero is used. These data are in thousand short tons and are converted into thousand barrels in CSEDS by applying a conversion factor of 5 barrels per short ton:

$$\text{PCEUPZZ} = \text{PCEUMZZ} * 5$$

The source for petroleum coke used at refineries, PCRFPUS, is the EIA series of reports entitled “Petroleum Statement, Annual” and predecessor reports. For 1960 through 1980, the data are provided in thousand short tons. For consistency with later years’ data, the 1960 through 1980 data were first converted into thousand barrels before being used in CSEDS.

The data for petroleum coke consumed by electric utilities are available by State. Other petroleum coke consumption data are available only on a U.S. level and are accredited to the industrial sector in CSEDS, either as petroleum coke used as catalyst coke at refineries in a process for increasing the yield of gasoline from crude oil (catalytic cracking) or as petroleum coke used for all other industrial uses (mainly for conversion into electrodes that are consumed in the production of aluminum). The industrial petroleum coke consumption series are apportioned to the States by using the data series that indicate the size of the refining industry and aluminum production industry in each State. The capacity of refineries’ catalytic cracking equipment (CTCAPZZ) and the aluminum ingot production capacity (AICAPZZ) are not measured in thousand barrels, but since these data series are used only to apportion U.S. industrial consumption of petroleum coke to the States, they do not need to be converted into thousand barrels.

The U.S. totals for the State-level data series are calculated by summing the State data.

To estimate industrial consumption of petroleum coke, electric utility consumption is subtracted from the total U.S. petroleum coke product supplied:

$$\text{PCICPUS} = \text{PCTCPUS} - \text{PCEUPUS}$$

The petroleum coke used at refineries in the United States as catalytic coke is subtracted from the U.S. industrial sector consumption to derive consumption of petroleum coke by all other industrial users:

$$\text{PCOCPUS} = \text{PCICPUS} - \text{PCRFPUS}$$

State-level estimates of the catalytic coke portion of the industrial sector are calculated by assuming that each State consumes catalytic coke in proportion to the catalytic cracking charge capacity of the refineries in the State:

$$\text{PCRFPZZ} = (\text{CTCAPZZ} / \text{CTCAPUS}) * \text{PCRFPUS}$$

State-level estimates of the petroleum coke consumed by the other industrial users are assumed to be in proportion to each State's aluminum ingot production capacity:

$$\text{PCOCPZZ} = (\text{AICAPZZ} / \text{AICAPUS}) * \text{PCOCPUS}$$

The State totals for the industrial sector use of petroleum coke are added:

$$\text{PCICPZZ} = \text{PCRFPZZ} + \text{PCOCPZZ}$$

Total petroleum coke consumption by State is industrial use plus electric utility use:

$$\text{PCTCPZZ} = \text{PCICPZZ} + \text{PCEUPZZ}$$

British Thermal Units (Btu)

Petroleum coke has a heat content value of approximately 6.024 million Btu per barrel. This factor is applied to convert petroleum coke estimated consumption from physical units to Btu by State and at the U.S. level:

$$\text{PCICBZZ} = \text{PCICPZZ} * 6.024$$

$$\text{PCICBUS} = \Sigma \text{PCICBZZ}$$

$$\text{PCEUBZZ} = \text{PCEUPZZ} * 6.024$$

$$\text{PCEUBUS} = \Sigma \text{PCEUBZZ}$$

$$\text{PCTCBZZ} = \text{PCICBZZ} + \text{PCEUBZZ}$$

$$\text{PCTCBUS} = \Sigma \text{PCTCBZZ}$$

Additional Calculations

Additional calculations are performed in the Combined State Energy Data System (CSEDS) to provide petroleum coke consumption estimates for the price and expenditure calculations published in the *State Energy Price and Expenditure Report*. Petroleum coke consumed by all other industrial users (PCOCB) is calculated at the State and U.S. levels:

$$\text{PCOCBZZ} = \text{PCOCPZZ} * 6.024$$

$$\text{PCOCBUS} = \Sigma \text{PCOCBZZ}$$

Data Sources for Petroleum Coke

AICAPZZ — Aluminum ingot production capacity in each State.

- 1960 through 1973: American Bureau of Metal Statistics, *Year Book*.
- 1974 through 1994: American Bureau of Metal Statistics, *Non-Ferrous Metal Data*, table titled "Aluminum Ingot Production Capacity."
Note: Capacities for individual plants owned by one company have been withheld since 1986. The company's total capacity has been apportioned to the individual plants on the basis of their proportional capacities in 1985.
- 1995 forward: Data series is discontinued. 1994 data used for all years.

CTCAPZZ — Catalytic cracking charge capacity of petroleum refineries by State.

- 1960: Data are unavailable from published reports. The 1961 values are used for 1960.
- 1961 through 1963: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Refineries in the United States." The specific tables are:
 - 1961 and 1962: Table 7, under "Cracking Capacity" column heading "Charge."
 - 1963: Table 6, under "Catalytic-Cracking Capacity" column heading "Charge."
- 1964 through 1976: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Refineries in the United States and Puerto Rico," Table 2, all entries next to "Cat. Ck." summed by State.
- 1977: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and Puerto Rico," Table 2, all entries next to "Cat. Ck." summed by State.
- 1978: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and U.S. Territories," Table 2, all entries next to "Cat. Ck." summed by State.
- 1979 and 1980: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and U.S. Territories." The specific tables are:
 - 1979: Table 2, sum of "Catalytic Cracking" columns, "Fresh" and "Recycle."
 - 1980: Table 1, sum of "Catalytic Cracking (fresh)" and "Catalytic Cracking (recycle)" columns.

- 1981 forward: EIA, *Petroleum Supply Annual*, sum of “Catalytic Cracking (Fresh)” and “Catalytic Cracking (Recycled)” columns in the following tables:
 - 1981 through 1983: Table 1.
 - 1984: Table 30.
 - 1985 through 1989: Table 29.
 - 1989 through 1994: Table 36.
 - 1995: Data series became biannual. 1994 data used for 1995.
 - 1996: Table 36.
 - 1997: 1996 data used for 1997.

PCEUMZZ — Petroleum coke consumed by the electric utilities by State.

- 1960 through 1969: No data available. Values are assumed to be zero.
- 1970 forward: EIA, Form EIA-759, “Monthly Power Plant Report,” and predecessor forms.

PCRFPUS — Petroleum coke consumed at refineries (both catalyst and marketable) in the United States.

- 1960: No data available. The 1961 value is used for 1960.
- 1961 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Petroleum Statement, Annual.” The specific tables are:
 - 1961 and 1962: Table 18.
 - 1962 through 1966: Table 19.
 - 1967: Table 18.
 - 1968: Table 19.
 - 1969 through 1972: Table 18.
 - 1973 and 1974: Table 21.
 - 1975: Table 22.
- 1976 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual.” The specific tables are:
 - 1976: Table 22.
 - 1977: Table 21.
 - 1978 through 1980: Table 20.
- 1981 forward: EIA, *Petroleum Supply Annual*. The specific tables are:
 - 1981 and 1982: Table 17.
 - 1983: Table 15.
 - 1984: Table 44.
 - 1985: Table 43.

- 1986 through 1988: Table 38.
- 1989 through 1992: Table 45.
- 1993 and 1994: Table 47.
- 1995: Table 36.
- 1996: Table 47.
- 1997: Table 36.

PCTCPUS — Petroleum coke total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Report*, “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Residual Fuel

Physical Units

Since State-level end-use consumption data for residual fuel (with the exception of electric utilities data) are not available, sales of residual fuel into or within each State, in thousand barrels, published by the Energy Information Administration (EIA), are used to estimate residual fuel consumption. “ZZ” in the following variable names represents the two-letter State code that differs for each State:

- RFBKPZZ = residual fuel sold for vessel bunkering use (i.e., the fueling of commercial or private boats, such as pleasure craft, fishing boats, tugboats, and ocean-going vessels, including vessels operated by oil companies, and fueling for other marine purposes), excluding sales to the Armed Forces;
- RFCMPZZ = residual fuel sold to the commercial sector for heating;
- RFIBPZZ = residual fuel sold to industrial establishments for space heating and for other industrial use (i.e., for all uses to mines, smelters, plants engaged in producing manufactured products, in processing goods, and in assembling);
- RFMIPZZ = residual fuel sold to the Armed Forces, regardless of use;
- RFMSPZZ = residual fuel sold for all other uses not identified in other sales categories;

RFOCPZZ = residual fuel sold for oil company use, including all fuel oil, crude oil, or acid sludge used as fuel at refineries, by pipelines, or in field operations; and

RFRRPZZ = residual fuel sold to the railroads for use in fueling trains, operating railroad equipment, space heating of buildings, and other operations.

Two other data series that represent consumption of residual fuel are:

RFEUPZZ = residual fuel consumed by electric utilities in each State, in thousand barrels.

RFTCPUS = residual fuel total supplied in the United States, in thousand barrels.

Residual fuel oil consumed by electric utilities, RFEUPZZ, is collected by EIA on Form EIA-759, "Monthly Power Plant Report," and predecessor forms. (See Note 3 at the end of this residual fuel section for further information on changes in this series' data definitions.)

Total U.S. consumption of residual fuel, RFTCPUS, is the product supplied series in EIA's publication *Petroleum Supply Annual*.

To begin calculating residual fuel State and end-use consumption estimates, all State-level data series are summed to provide totals for the United States.

Then the data series are combined as closely as possible into the major end-use sectors used in CSEDS. No residual fuel is sold to the residential sector. Residual fuel sales to the commercial sector is the RFCMPZZ series.

The sales of residual fuel to the industrial sector in each State, RFINPZZ, is the sum of the residual fuel sold for industrial use, including industrial space heating (RFIBPZZ), for oil company use (RFOCPZZ), and for all other uses (RFMSPZZ):

RFINPZZ = RFIBPZZ + RFOCPZZ + RFMSPZZ

RFINPUS = Σ RFINPZZ

The sales of residual fuel to the transportation sector in each State, RFTRPZZ, is the sum of the residual fuel sales for vessel bunkering (RFBKPZZ), military use (RFMIPZZ), and railroad use (RFRRPZZ):

RFTRPZZ = RFBKPZZ + RFMIPZZ + RFRRPZZ

RFTRPUS = Σ RFTRPZZ

Sales of residual fuel oil to the commercial, industrial, and transportation sectors are added to create a subtotal of sales to all sectors other than the electric utility sector (RFNDPZZ):

RFNDPZZ = RFCMPZZ + RFINPZZ + RFTRPZZ

RFNDPUS = Σ RFNDPZZ

The estimated residual fuel consumption for the United States by all sectors other than the electric utility sector (RFNCPUS) is calculated by subtracting the total residual fuel consumption at electric utilities from the total U.S. residual fuel consumption:

RFNCPUS = RFTCPUS - RFEUPUS

This U.S. subtotal of residual fuel consumption by the end-use sectors combined (RFNCPUS) is apportioned to the States by using the States' end-use sector sales data. The assumption is made that each State consumes residual fuel in proportion to the amount sold in that State:

RFNCPZZ = (RFNDPZZ / RFNDPUS) * RFNCPUS

The end-use sectors' subtotal for each State is further divided into estimates for each sector in proportion to each sector's sales. The estimated commercial sector consumption in each State, RFCCPZZ, is calculated:

RFCCPZZ = (RFCMPZZ / RFNDPZZ) * RFNCPZZ

The industrial sector's estimated consumption in each State, RFICPZZ, is calculated:

RFICPZZ = (RFINPZZ / RFNDPZZ) * RFNCPZZ

The transportation sector's estimated consumption in each State, RFACPZZ, is calculated:

$$\text{RFACPZZ} = (\text{RFTRPZZ} / \text{RFNDPZZ}) * \text{RFNCPZZ}$$

The consumption of residual fuel in the United States by the major end-use sectors is estimated by adding the States' estimated consumption.

Total State residual fuel consumption is the sum of the end-use sectors' consumption subtotal and the electric utilities consumption:

$$\text{RFTCPZZ} = \text{RFNCPZZ} + \text{RFEUPZZ}$$

British Thermal Units (Btu)

Residual fuel has a heat content value of approximately 6.287 million Btu per barrel. This factor is applied to convert residual fuel estimated consumption from physical units to Btu as shown in the following examples:

$$\text{RFCCBZZ} = \text{RFCCPZZ} * 6.287$$

$$\text{RFICBZZ} = \text{RFICPZZ} * 6.287$$

$$\text{RFTCBZZ} = \text{RFCCBZZ} + \text{RFICBZZ} + \text{RFACBZZ} + \text{RFEUBZZ}$$

The U.S. level Btu consumption estimates are calculated as the sum of the States' Btu consumption.

Additional Notes on Residual Fuel

1. "Sales" data are actually called "shipments" in the source documents for 1960 and 1961; "consumption" for 1962 through 1966; "shipments" for 1967; "sales" from 1968 through 1978; "deliveries" for 1979 through 1983; and "sales" for 1984 forward.
2. In 1979, the Energy Information Administration implemented a new survey form, EIA-172, to obtain deliveries of fuel oil and kerosene data and updated the list of respondents. (A detailed explanation is published in the *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979.") In the new survey form, certain end-use categories were redefined—in many cases, to collect more disaggregated data. The reclassifications resulted in some end-use categories that were no longer comparable with those in previous surveys. Where discontinuities occurred, estimates for the pre-1979 years have been made in

CSEDS to conform with the 1979 fuel oil deliveries classifications. The pre-1979 deliveries estimates are not published in this report but are used in CSEDS to disaggregate the known U.S. total product supplied (consumption) into State and major end-use sector consumption estimates.

For residual fuel deliveries in 1979, the end-use categories "commercial" and "industrial" are available. The pre-1979 deliveries categories are called "heating" and "industrial." While the pre-1979 categories individually are not continuous with the 1979 categories, their subtotals are related. That is, a general comparison can be made between the sum of commercial and industrial deliveries in 1979 and the sum of heating and industrial deliveries in the pre-1979 years. Therefore, the following method was applied to present a comparable series for residual fuel delivered to the commercial and industrial sectors:

- For each of the pre-1979 years, a subtotal was created for each State by adding each State's heating and industrial deliveries categories. A comparable 1979 subtotal was created by adding each State's commercial and industrial deliveries categories.
- Commercial and industrial shares of the subtotal in 1979 were calculated for each State.
- These 1979 end-use shares were then applied to each pre-1979 subtotal of residual fuel deliveries in each State to create State estimates of end-use deliveries for 1960 through 1978.

The 1980 through 1982 residual fuel deliveries data are based on the same survey as that used for 1979; therefore, the 1980 through 1982 data are directly comparable to 1979 data.

In 1984, EIA again updated the list of respondents for this survey, and the Form EIA-172 became the Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report." EIA did not conduct a fuel oil and kerosene sales survey for 1983. The 1983 estimates in CSEDS are based on 1984 data obtained from the Form EIA-821. Statistical procedures and methodologies used for the Form EIA-821 differ from those used in previous years. Therefore, the 1983 and forward sales data may not be directly comparable to the pre-1983 data. (In the

source document, the sales data for 1983 forward are reported in thousand gallons. These data were first converted to thousand barrels before being entered into CSEDS.)

3. The fuel oil at electric utilities data for all years and States are actual fuel oil consumption numbers collected from electric utilities by EIA on Form EIA-759, "Monthly Power Plant Report," and predecessor forms. Due to changes in fuel oil reporting classifications on the Form EIA-759 over the years, it is not possible to develop a thoroughly consistent series for all years. However, over time, data more accurately disaggregating fuel oil into distillate fuel and residual fuel have become available. For 1960 through 1969, only total fuel oil consumed at electric utilities by State is available. For 1970 through 1979, fuel oil consumed by plant type (internal combustion and gas turbine plants combined and steam plants) by State are available. For 1980 forward, consumption of light oil at all plant types combined and consumption of heavy oil at all plant types combined are available by State. In CSEDS, the following assumptions have been made:

- 1960 through 1969 — State estimates of fuel oil consumption by plant type have been created for each year by applying the shares of steam plants (primarily residual fuel) and internal combustion and gas turbine plants (primarily distillate fuel plus small amounts of jet kerosene) by State in 1970 to each year's total fuel oil consumption at electric utilities for 1960 through 1969.
- 1970 through 1979 — fuel oil consumed by steam plants is assumed to equal residual fuel consumption, and fuel oil consumed by internal combustion and gas turbine plants is assumed to equal distillate fuel plus jet kerosene consumption.
- 1980 and forward — total heavy oil consumption at all plant types is assumed to equal residual fuel consumption, and total light oil consumption at all plant types is assumed to equal distillate fuel plus jet kerosene consumption.

The data series thus derived for CSEDS for residual fuel and distillate fuel plus jet kerosene consumption at electric utilities is considered to

be actual consumption at electric utilities for each State and each year.

Data Sources for Residual Fuel

RFBKPZZ — Residual fuel sold for vessel bunkering use by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are:
 - 1960 and 1961: Table 17.
 - 1962 and 1963: Table 16.
 - 1964 and 1965: Table 15.
 - 1966 through 1975: Table 11.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 11.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A13.
 - 1984 and 1985: July 1986 issue, Table A3.
 - 1986 and 1987: June 1988 issue, Table A5.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 5.

RFCMPZZ — Residual fuel sold to the commercial sector for heating.

- 1960 through 1978: EIA estimates based on statistics of commercial sector deliveries of residual fuel from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 2. State ratios based on 1979 commercial sector deliveries were applied to each State's sum of heating plus industrial deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 2, on page 389.)
- 1979 and 1980: EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Notes: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS. Data for Hawaii in 1986 through 1990 reflect unpublished revisions from an EIA internal memorandum from the Office of Oil and Gas to the Office of Energy Markets and End Use, "Revising Historical Petroleum Data," February 26, 1993.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A13.
 - 1984 and 1985: July 1986 issue, Table A3.
 - 1986 and 1987: June 1988 issue, Table A5.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 5.

RFEUPZZ — Residual fuel consumed at electric utilities.

- EIA, Form EIA-759, "Monthly Power Plant Report," and predecessor forms. The following assumptions have been made:
 - 1960 through 1969: Only total fuel oil consumed at electric utilities by State is available. State estimates of residual fuel consumption were created for each year by applying the shares of steam plants (primarily residual fuel) by State from 1970 to each year's total fuel oil consumption at electric utilities for 1960 through 1969.
 - 1970 through 1979: Fuel oil consumed by plant type by State is available. Fuel oil consumed by steam plants is assumed to equal residual fuel consumption.
 - 1980 forward: Consumption of light and heavy oil at all plant types by State is available. Total heavy oil consumption at all plant types is assumed to equal residual fuel consumption.

RFIBPZZ — Residual fuel sold to industrial establishments for heating and for other industrial use.

- 1960 through 1978: EIA, estimates based on statistics of industrial sector deliveries of residual fuel from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 2. State ratios based on 1979 industrial sector deliveries were applied to each State's sum of heating plus industrial deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 2, on page 389.)
- 1979 and 1980: EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A13.
 - 1984 and 1985: July 1986 issue, Table A3.
 - 1986 and 1987: June 1988 issue, Table A5.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 5.

RFMIPZZ — Residual fuel sold to the Armed Forces regardless of use by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are:
 - 1960 and 1961: Table 18.
 - 1962 and 1963: Table 17.
 - 1964 and 1965: Table 16.
 - 1966 through 1975: Table 12.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 12.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A13.
 - 1984 and 1985: July 1986 issue, Table A3.
 - 1986 and 1987: June 1988 issue, Table A5.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 5.

RFMSPZZ — Residual fuel sold for miscellaneous uses by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are:
 - 1960 through 1962: Table 19.
 - 1963 and 1964: Table 18.
 - 1965 through 1967: Table 17.

— 1968 through 1975: Table 14.

- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 14.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 2, column “Other.”
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5, column “All Other.”

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS. The data series is titled “All Other.”

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A13.
 - 1984 and 1985: July 1986 issue, Table A3.
 - 1986 and 1987: June 1988 issue, Table A5.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 5.

RFOCPZZ — Residual fuel sold for use by oil companies by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:
 - 1960 and 1961: Table 14.
 - 1962 and 1963: Table 13.
 - 1964 and 1965: Table 12.
 - 1966 through 1975: Table 9.
- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 9.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A13.
 - 1984 and 1985: July 1986 issue, Table A3.
 - 1986 and 1987: June 1988 issue, Table A5.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 5.

RFRRPZZ — Residual fuel sold for use by railroads by State.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Shipments of Fuel Oil and Kerosene.” The specific tables are:
 - 1960 and 1961: Table 16.
 - 1962 and 1963: Table 15.
 - 1964 and 1965: Table 14.
 - 1966 through 1975: Table 10.
- 1976 through 1978: EIA, *Energy Data Reports*, “Sales of Fuel Oil and Kerosene,” Table 10.
- 1979 and 1980: EIA, *Energy Data Reports*, “Deliveries of Fuel Oil and Kerosene,” Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward were published in thousand gallons. They were converted to thousand barrels by dividing by 42 before being entered into CSEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are:
 - 1983: July 1985 issue, Table A13.
 - 1984 and 1985: July 1986 issue, Table A3.
 - 1986 and 1987: June 1988 issue, Table A5.
- 1988 and 1989: EIA, *Fuel Oil and Kerosene Sales 1989*, Table 5.
- 1990 forward: EIA, *Fuel Oil and Kerosene Sales*, Table 5, included in the “All Other” data (RFMSPZZ in CSEDS).

RFTCPUS — Residual fuel total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Other Petroleum Products

There are 16 petroleum products that are summed and called “other petroleum products” in CSEDS. These products, in thousand barrels, are:

ABTCPUS	= aviation gasoline blending components total consumed in the United States;
COTCPZZ	= crude oil (including lease condensate) total consumed in each State;
FNTCPUS	= petroleum feedstocks, naphtha less than 401° F, total consumed in the United States;
FOTCPUS	= petroleum feedstocks, other oils equal to or greater than 401° F, total consumed in the United States;
FSTCPUS	= petroleum feedstocks, still gas, total consumed in the United States;
MBTCPUS	= motor gasoline blending components total consumed in the United States;
MSTCPUS	= miscellaneous petroleum products total consumed in the United States;
NATCPUS	= natural gasoline (including isopentane) total consumed in the United States;
PCTCPUS	= petroleum coke total consumed in the United States;
PLTCPUS	= plant condensate total consumed in the United States;
PPTCPUS	= pentanes plus total consumed in the United States;
SGTCPUS	= still gas total consumed in the United States;
SNTCPUS	= special naphthas total consumed in the United States;
UOTCPUS	= unfinished oils total consumed in the United States;
USTCPUS	= unfractionated stream total consumed in the United States; and
WXTCPUS	= waxes total consumed in the United States.

The methods used to create State estimates for each of these products (except petroleum coke, which was described earlier in the petroleum coke documentation) are explained in the following sections. It is assumed that all of these products are used by the industrial sector, except for the small portion of petroleum coke consumed at electric utilities. State estimates are created for other petroleum products by using the following four variables to allocate the products to the States:

COCAPZZ	= crude oil operating capacity at refineries in each State, in barrels per calendar day;
OCVAVZZ	= value added in the manufacture of industrial organic chemicals in each State, in million dollars;
PIVAVZZ	= value added in the manufacture of paints and allied products in each State, in million dollars; and
CGVAVZZ	= value added in the manufacture of corrugated and solid fiber boxes, in million dollars.

Value added by manufacture is a measure of manufacturing activity that is derived by subtracting the cost of materials (which covers materials, supplies, containers, fuel, purchased electricity, and contract work) from the value of shipments. This difference is then adjusted by the net change in finished goods and work-in-process between the beginning and end-of-year inventories. Value added is considered to be the best value measure available for comparing the relative economic importance of manufacturing among industries and geographic areas. The value added data are from the Department of Commerce *Census of Manufactures* reports.

Crude Oil

Physical Units

State estimates for crude oil consumed in petroleum industry operations are the data series COTCPZZ. The U.S. total for this data series is summed:

$$\text{COTCPUS} = \Sigma \text{COTCPZZ}$$

Industrial consumption equals total consumption of crude oil:

$$\begin{aligned}\text{COICPZZ} &= \text{COTCPZZ} \\ \text{COICPUS} &= \text{COTCPUS}\end{aligned}$$

British Thermal Units (Btu)

Crude oil has a heat content value of approximately 5.800 million Btu per barrel. The calculations performed to estimate total Btu consumption and industrial use Btu consumption by State and for the United States are:

$COTCBZZ = COTCPZZ * 5.800$
 $COTCBUS = \Sigma COTCBZZ$
 $COICBZZ = COTCBZZ$
 $COICBUS = COTCBUS$

Data Source

COTCPZZ — Crude oil consumed in petroleum industry operations by State.

- 1960 through 1982: Crude oil used directly was included in distillate and residual fuel product supplied when reported to EIA. Zeros are entered for all years.
- 1983 forward: Data are available for Petroleum Administration for Defense (PAD) Districts, not by State. State estimates are calculated by allocating all crude oil consumption to the six States (Alaska, California, Colorado, Louisiana, Texas, and Utah) that reported distillate and residual fuels consumed by pipeline and leases in 1982. (Data on pipeline and lease consumption of fuels are not available after 1982.) Each State's 1982 ratio of distillate and residual fuels consumed by pipeline and leases to its respective 1982 PAD District total consumption of those fuels is calculated. This ratio is then applied to the 1983 forward PAD District totals of crude oil product supplied. The 1982 ratios are taken from the Form EIA-90, "Crude Oil Stocks Report," and the crude oil product supplied data are taken from the EIA *Petroleum Supply Annual*. The specific tables are:
 - 1983 through 1988: Tables 2 and 4 through 8.
 - 1989 forward: Tables 2, 4, 6, 8, 10, and 12.

Aviation Gasoline Blending Components; Petroleum Feedstocks, Still Gas; Motor Gasoline Blending Components; Still Gas; and Unfinished Oils

Physical Units

The five petroleum products in this category are consumed as refinery fuels. Beginning in 1986, still gas for petrochemical feedstocks and still gas for other uses are reported together in the source document. State consumption estimates of these products are created in proportion to each

State's crude oil operating capacity at refineries (COCAPZZ). The U.S. total for this variable is summed:

$COCAPUS = \Sigma COCAPZZ$

Aviation gasoline blending components State and U.S. consumption are estimated:

$ABTCPZZ = (COCAPZZ / COCAPUS) * ABTCPUS$
 $ABICPZZ = ABTCPZZ$
 $ABICPUS = ABTCPUS$

Petroleum feedstocks, still gas, State and U.S. consumption are estimated:

$FSTCPZZ = (COCAPZZ / COCAPUS) * FSTCPUS$
 $FSICPZZ = FSTCPZZ$
 $FSICPUS = FSTCPUS$

Motor gasoline blending components State and U.S. consumption are estimated:

$MBTCPZZ = (COCAPZZ / COCAPUS) * MBTCPUS$
 $MBICPZZ = MBTCPZZ$
 $MBICPUS = MBTCPUS$

Still gas State and U.S. consumption are estimated:

$SGTCPZZ = (COCAPZZ / COCAPUS) * SGTCPUS$
 $SGICPZZ = SGTCPZZ$
 $SGICPUS = SGTCPUS$

Unfinished oils State and U.S. consumption are estimated:

$UOTCPZZ = (COCAPZZ / COCAPUS) * UOTCPUS$
 $UOICPZZ = UOTCPZZ$
 $UOICPUS = UOTCPUS$

British Thermal Units (Btu)

Btu estimates for the five products in this group are developed by multiplying the estimated consumption of each individual product in physical units

by its respective heat content conversion factor. The calculations performed to estimate total Btu consumption and industrial use Btu consumption by State and for the United States are:

$$\begin{aligned} \text{ABTCBZZ} &= \text{ABTCPZZ} * 5.048 \\ \text{ABTCBUS} &= \Sigma \text{ABTCBZZ} \\ \text{ABICBZZ} &= \text{ABTCBZZ} \\ \text{ABICBUS} &= \text{ABTCBUS} \end{aligned}$$

$$\begin{aligned} \text{FSTCBZZ} &= \text{FSTCPZZ} * 6.000 \\ \text{FSTCBUS} &= \Sigma \text{FSTCBZZ} \\ \text{FSICBZZ} &= \text{FSTCBZZ} \\ \text{FSICBUS} &= \text{FSTCBUS} \end{aligned}$$

$$\begin{aligned} \text{MBTCBZZ} &= \text{MBTCPZZ} * 5.253 \\ \text{MBTCBUS} &= \Sigma \text{MBTCBZZ} \\ \text{MBICBZZ} &= \text{MBTCBZZ} \\ \text{MBICBUS} &= \text{MBTCBUS} \end{aligned}$$

$$\begin{aligned} \text{SGTCBZZ} &= \text{SGTCPZZ} * 6.000 \\ \text{SGTCBUS} &= \Sigma \text{SGTCBZZ} \\ \text{SGICBZZ} &= \text{SGTCBZZ} \\ \text{SGICBUS} &= \text{SGTCBUS} \end{aligned}$$

$$\begin{aligned} \text{UOTCBZZ} &= \text{UOTCPZZ} * 5.825 \\ \text{UOTCBUS} &= \Sigma \text{UOTCBZZ} \\ \text{UOICBZZ} &= \text{UOTCBZZ} \\ \text{UOICBUS} &= \text{UOTCBUS} \end{aligned}$$

Data Sources

ABTCPUS — Aviation gasoline blending components total consumed in the United States.

- 1960 through 1980: No data available. Values are assumed to be zero.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2

COCAPZZ — Crude oil operating capacity at refineries by State.

- 1960: U.S. Department of the Interior, Bureau of Mines, *Petroleum Refineries, Including Cracking Plants, in the United States*, Table 3.
- 1961 through 1963: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Refineries in the United States." The specific tables are:
 - 1961 and 1962: Table 3.
 - 1963: Table 1.
- 1964 through 1976: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Refineries in the United States and Puerto Rico," Table 1.
- 1977: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and Puerto Rico," Table 1.
- 1978 through 1980: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and U.S. Territories," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*. The specific tables are:
 - 1981 through 1983: Table 1.
 - 1984: Table 30.
 - 1985 through 1988: Table 29.
 - 1989 through 1994: Table 36.
 - 1995: Unpublished data based on Form EIA-810.
 - 1996 forward: Table 36.

FSTCPUS — Petrochemical feedstocks, still gas, total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, Petroleum Statement, Annual," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 14.
- 1983 through 1985: EIA, *Petroleum Supply Annual*, Table 12.
- 1986 forward: EIA, *Petroleum Supply Annual*, Table 2, included in "Still Gas."

MBTCPUS — Motor gasoline blending components total consumed in the United States.

- 1960 through 1980: No data available. Values are assumed to be zero.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

SGTCPUS — Still gas total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 14.
- 1983 through 1985: EIA, *Petroleum Supply Annual*, Table 12.
- 1986 forward: EIA, *Petroleum Supply Annual*, Table 2.

UOTCPUS — Unfinished oils total consumed in the United States.

- 1960 through 1980: No data available. Values assumed to be zero.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Petroleum Feedstocks, Naphtha Less Than 401° F; Petroleum Feedstocks, Other Oils Equal to or Greater Than 401° F; Miscellaneous Petroleum Products; Natural Gasoline (Including Isopentane); Plant Condensate; Pentanes Plus; and Unfractionated Stream.

Physical Units

The seven petroleum products in this category are allocated to the States in proportion to the value added in the manufacture of industrial organic chemicals in each State (OCVAVZZ).

The two petroleum feedstocks are consumed by the chemical industry in producing petrochemical "building blocks" that, in turn, are converted to such products as synthetic fibers, synthetic rubber, and plastics.

Miscellaneous products include such products as petrolatum, synthetic natural gas feedstocks, and specialty oils (e.g., hydraulic oils, insulating oils, medicinal oils, rust preventatives, and spray oils). Finished petrochemicals usually constitute the largest volume of miscellaneous product, and it is assumed that the chief consuming industry for this product line is the chemical industry.

Natural gasoline (including isopentane), plant condensate, pentanes plus, and unfractionated stream are included in this group because the chemical industry is the only one that could readily utilize these lighter liquid hydrocarbons (as petrochemical feedstocks). Beginning in 1984, in the source document, natural gasoline (including isopentane) and plant condensate are reported together as a new product, pentanes plus. At the same time, unfractionated stream was dropped because its components were reported separately as liquefied petroleum gases.

The U.S. total for the data series used to apportion these products to the States is summed:

$$\text{OCVAVUS} = \Sigma \text{OCVAVZZ}$$

Total petroleum feedstocks, naphtha less than 401° F, State and U.S. consumption are estimated:

$$\begin{aligned}\text{FNTCPZZ} &= (\text{OCVAVZZ} / \text{OCVAVUS}) * \text{FNTCPUS} \\ \text{FNICPZZ} &= \text{FNTCPZZ} \\ \text{FNICPUS} &= \text{FNTCPUS}\end{aligned}$$

Petroleum feedstocks, other oils equal to or greater than 401° F, State and U.S. consumption are estimated:

$$\begin{aligned}\text{FOTCPZZ} &= (\text{OCVAVZZ} / \text{OCVAVUS}) * \text{FOTCPUS} \\ \text{FOICPZZ} &= \text{FOTCPZZ} \\ \text{FOICPUS} &= \text{FOTCPUS}\end{aligned}$$

Miscellaneous petroleum products State and U.S. consumption are estimated:

$$\begin{aligned}\text{MSTCPZZ} &= (\text{OCVAVZZ} / \text{OCVAVUS}) * \text{MSTCPUS} \\ \text{MSICPZZ} &= \text{MSTCPZZ} \\ \text{MSICPUS} &= \text{MSTCPUS}\end{aligned}$$

Natural gasoline (including isopentane) State and U.S. consumption are estimated:

$$\begin{aligned}\text{NATCPZZ} &= (\text{OCVAVZZ} / \text{OCVAVUS}) * \text{NATCPUS} \\ \text{NAICPZZ} &= \text{NATCPZZ} \\ \text{NAICPUS} &= \text{NATCPUS}\end{aligned}$$

Plant condensate State and U.S. consumption are estimated:

$$\begin{aligned}\text{PLTCPZZ} &= (\text{OCVAVZZ} / \text{OCVAVUS}) * \text{PLTCPUS} \\ \text{PLICPZZ} &= \text{PLTCPZZ} \\ \text{PLICPUS} &= \text{PLTCPUS}\end{aligned}$$

Pentane plus State and U.S. consumption are estimated:

$$\begin{aligned}\text{PPTCPZZ} &= (\text{OCVAVZZ} / \text{OCVAVUS}) * \text{PPTCPUS} \\ \text{PPICPZZ} &= \text{PPTCPZZ} \\ \text{PPICPUS} &= \text{PPTCPUS}\end{aligned}$$

Unfractionated stream State and U.S. consumption are estimated:

$$\begin{aligned}\text{USTCPZZ} &= (\text{OCVAVZZ} / \text{OCVAVUS}) * \text{USTCPUS} \\ \text{USICPZZ} &= \text{USTCPZZ} \\ \text{USICPUS} &= \text{USTCPUS}\end{aligned}$$

British Thermal Units (Btu)

Btu estimates for the seven petroleum products in this group are developed by multiplying each individual product's estimated consumption in physical units by its respective approximate heat content conversion factor. The calculations performed to estimate total Btu consumption and industrial use Btu consumption by State and for the United States are:

$$\begin{aligned}\text{FNTCBZZ} &= \text{FNTCPZZ} * 5.248 \\ \text{FNTCBUS} &= \Sigma \text{FNTCBZZ} \\ \text{FNICBZZ} &= \text{FNTCBZZ} \\ \text{FNICBUS} &= \text{FNTCBUS}\end{aligned}$$

$$\begin{aligned}\text{FOTCBZZ} &= \text{FOTCPZZ} * 5.825 \\ \text{FOTCBUS} &= \Sigma \text{FOTCBZZ} \\ \text{FOICBZZ} &= \text{FOTCBZZ} \\ \text{FOICBUS} &= \text{FOTCBUS}\end{aligned}$$

$$\begin{aligned}\text{MSTCBZZ} &= \text{MSTCPZZ} * 5.796 \\ \text{MSTCBUS} &= \Sigma \text{MSTCBZZ} \\ \text{MSICBZZ} &= \text{MSTCBZZ} \\ \text{MSICBUS} &= \text{MSTCBUS}\end{aligned}$$

$$\begin{aligned}\text{NATCBZZ} &= \text{NATCPZZ} * 4.620 \\ \text{NATCBUS} &= \Sigma \text{NATCBZZ} \\ \text{NAICBZZ} &= \text{NATCBZZ} \\ \text{NAICBUS} &= \text{NATCBUS}\end{aligned}$$

$$\begin{aligned}\text{PLTCBZZ} &= \text{PLTCPZZ} * 5.418 \\ \text{PLTCBUS} &= \Sigma \text{PLTCBZZ} \\ \text{PLICBZZ} &= \text{PLTCBZZ} \\ \text{PLICBUS} &= \text{PLTCBUS}\end{aligned}$$

$$\begin{aligned}\text{PPTCBZZ} &= \text{PPTCPZZ} * 4.620 \\ \text{PPTCBUS} &= \Sigma \text{PPTCBZZ} \\ \text{PPICBZZ} &= \text{PPTCBZZ} \\ \text{PPICBUS} &= \text{PPTCBUS}\end{aligned}$$

$$\begin{aligned}\text{USTCBZZ} &= \text{USTCPZZ} * 5.418 \\ \text{USTCBUS} &= \Sigma \text{USTCBZZ} \\ \text{USICBZZ} &= \text{USTCBZZ} \\ \text{USICBUS} &= \text{USTCBUS}\end{aligned}$$

Data Sources

FNTCPUS — Petrochemical feedstocks, naphtha, less than 401° F, total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

FOTCPUS — Petrochemical feedstocks, other oils, equal to or greater than 401° F, total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

MSTCPUS — Miscellaneous petroleum products consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*. “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

NATCPUS — Natural gasoline total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*. “Petroleum Statement, Annual,” Table 1.
- 1981 through 1983: EIA, *Petroleum Supply Annual*, Table 2.
- 1984 forward: EIA, *Petroleum Supply Annual*, Table 2, included in “Pentanes Plus.”

OCVAVZZ — Value added by the manufacture of industrial organic chemicals by State.

- 1960 through 1970: U.S. Department of Commerce, *1967 Census of Manufactures*, Volume II, Part 2, SIC 2818. The 1963 State data are used for the years 1960 through 1965, and the 1967 State data are used for 1966 through 1970.
- 1971 through 1980: U.S. Department of Commerce, *1977 Census of Manufactures*, Industry Series, SIC 2869. The 1972 State data are used for 1971 through 1975, and the 1977 State data are used for 1976 through 1980.
- 1980 through 1985: U.S. Department of Commerce, *1987 Census of Manufactures* (Final Report), Industry Series, SIC 2869. The 1982 State data are used for 1981 through 1985.
- 1986 forward: U.S. Department of Commerce, *1992 Census of Manufactures* (Final Report), Industry Series, SIC 2869. The 1987 State data are used for 1986 through 1990, and the 1992 State data are used for 1991 forward.

PLTCPUS — Plant condensate total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 through 1983: EIA, *Petroleum Supply Annual*, Table 2.
- 1984 forward: EIA, *Petroleum Supply Annual*, Table 2, included in “Pentanes Plus.”

PPTCPUS — Pentanes plus total consumed in the United States.

- 1960 through 1983: Data were reported separately as natural gasoline, isopentane, and plant condensate.
- 1984 forward: EIA, *Petroleum Supply Annual*, Table 2.

USTCPUS — Unfractionated stream total consumed in the United States.

- 1960 through 1978: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1, included in “Plant Condensate.”
- 1979 and 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 through 1983: EIA, *Petroleum Supply Annual*, Table 2.
- 1984 forward: EIA, *Petroleum Supply Annual*, Table 2, individual components are reported separately.

Special Naphthas

Physical Units

Special naphthas are used as paint and varnish thinners and dry cleaning liquids or solvents. This petroleum product is allocated to the States in proportion to the value added in the manufacture of paints and allied products in each State (PIVAVZZ).

The U.S. total for the apportioning data series is calculated:

$$\text{PIVAVUS} = \Sigma \text{PIVAVZZ}$$

Special naphthas State and U.S. consumption are estimated:

$SNTCPZZ = (PIVAVZZ / PIVAVUS) * SNTCPUS$
 $SNICPZZ = SNTCPZZ$
 $SNICPUS = SNTCPUS$

British Thermal Units (Btu)

Special naphthas have a heat content value of approximately 5.248 million Btu per barrel. This factor is applied to convert special naphthas estimated consumption from physical units to Btu by State and for the United States:

$SNTCBZZ = SNTCPZZ * 5.248$
 $SNTCBUS = \Sigma SNTCBZZ$
 $SNICBZZ = SNTCBZZ$
 $SNICBUS = SNTCBUS$

Data Sources

PIVAVZZ — Value added by the manufacture of paints and allied products by State.

- 1960 through 1970: U.S. Department of Commerce, *1967 Census of Manufactures*, Volume II, Part 2, SIC 2851. The 1963 State data are used for the years 1960 through 1965, and the 1967 State data are used for 1966 through 1970.
- 1971 through 1980: U.S. Department of Commerce, *1977 Census of Manufactures*, Industry Series, SIC 2851. The 1972 State data are used for 1971 through 1975, and the 1977 State data are used for 1976 through 1980.
- 1981 through 1985: U.S. Department of Commerce, *1987 Census of Manufactures* (Final Report), Industry Series, SIC 2851. The 1982 State data are used for the years 1981 through 1985.
- 1986 forward: U.S. Department of Commerce, *1992 Census of Manufactures* (Final Report), Industry Series, SIC 2851. The 1987 State data are used for the years 1986 through 1990, and the 1992 State data are used for 1991 forward.

SNTCPUS — Special naphthas total consumed in the United States.

- 1960 through 1963: Data included in motor gasoline.

- 1964 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Waxes

Physical Units

Because petroleum waxes are very cost-effective moisture and gas barriers, food packaging is the largest market for petroleum waxes in the United States, accounting for more than 50 percent of petroleum wax consumption. Therefore, waxes are allocated to the States in proportion to the value added in the manufacture of corrugated and solid fiber boxes (CGVAVZZ).

The U.S. total for this variable is summed:

$CGVAVUS = \Sigma CGVAVZZ$

State and U.S. consumption are estimated:

$WXTCPZZ = (CGVAVZZ / CGVAVUS) * WXTCPUS$
 $WXICPZZ = WXTCPZZ$
 $WXICPUS = WXTCPUS$

British Thermal Units (Btu)

Waxes have a heat content value of approximately 5.537 million Btu per barrel. This factor is applied to convert the estimated consumption of waxes from physical units to Btu by State and at the U.S. level:

$WXTCBZZ = WXTCPZZ * 5.537$
 $WXTCBUS = \Sigma WXTCBZZ$
 $WXICBZZ = WXTCBZZ$
 $WXICBUS = WXTCBUS$

Data Sources

CGVAVZZ — Value added by the manufacture of sanitary food containers by State. Beginning with 1992 data, this series became value added by the manufacture of corrugated and solid fiber boards by State.

- 1960 through 1965: U.S. Department of Commerce, *1963 Census of Manufactures*, Volume II, Part 1, SIC 2654. The 1963 State data are used for the years 1960 through 1965.
- 1966 through 1970: U.S. Department of Commerce, *1967 Census of Manufactures*, Volume II, Part 2, SIC 2654. The 1967 State data are used for 1966 through 1970.
- 1971 through 1980: U.S. Department of Commerce, *1977 Census of Manufactures*, Industry Series, SIC 2654. The 1972 State data are used for 1971 through 1975, and the 1977 State data are used for 1976 through 1980.
- 1981 through 1990: U.S. Department of Commerce, *1982 Census of Manufactures* (Final Report), Industry Series, SIC 2654. The 1982 State data are used for 1981 through 1990.
- 1991 forward: U.S. Department of Commerce, *1992 Census of Manufactures* (Final Report), Industry Series, SIC 2653. The 1992 State data are used for 1991 forward.

WXTCPUS — Waxes total consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, “Petroleum Statement, Annual,” Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, “Petroleum Statement, Annual,” Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, Table 2.

Total Other Petroleum Products

Physical Units

Total other petroleum products is the sum of the 16 “other petroleum products.” All of these products are consumed by the industrial sector except for some petroleum coke consumed by electric utilities (PCEUP), which is calculated in CSEDS with electric utility fuel consumption. State and U.S. industrial use of these other petroleum products are calculated:

$$\begin{aligned} \text{POICPZZ} = & \text{ABICPZZ} + \text{COICPZZ} + \text{FNICPZZ} + \text{FOICPZZ} + \\ & \text{FSICPZZ} + \text{MBICPZZ} + \text{MSICPZZ} + \text{NAICPZZ} + \\ & \text{PCICPZZ} + \text{PLICPZZ} + \text{PPICPZZ} + \text{SGICPZZ} + \\ & \text{SNICPZZ} + \text{UOICPZZ} + \text{USICPZZ} + \text{WXICPZZ} \end{aligned}$$

$$\text{POICPUS} = \Sigma \text{POICPZZ}$$

Total consumption of these products (including petroleum coke consumption by electric utilities) is calculated:

$$\begin{aligned} \text{POTCPZZ} = & \text{ABTCPZZ} + \text{COTCPZZ} + \text{FNTCPZZ} + \text{FOTCPZZ} + \\ & \text{FSTCPZZ} + \text{MBTCPZZ} + \text{MSTCPZZ} + \text{NATCPZZ} + \\ & \text{PCTCPZZ} + \text{PLTCPZZ} + \text{PPTCPZZ} + \text{SGTCPZZ} + \\ & \text{SNTCPZZ} + \text{UOTCPZZ} + \text{USTCPZZ} + \text{WXTCPZZ} \end{aligned}$$

$$\text{POTCPUS} = \Sigma \text{POTCPZZ}$$

British Thermal Units (Btu)

Estimated consumption of all 16 “other petroleum products” in Btu is the sum of the Btu consumption of each product by the industrial sector. The State and U.S. totals are calculated:

$$\begin{aligned} \text{POICBZZ} = & \text{ABICBZZ} + \text{COICBZZ} + \text{FNICBZZ} + \text{FOICBZZ} + \\ & \text{FSICBZZ} + \text{MBICBZZ} + \text{MSICBZZ} + \text{NAICBZZ} + \\ & \text{PCICBZZ} + \text{PLICBZZ} + \text{PPICBZZ} + \text{SGICBZZ} + \\ & \text{SNICBZZ} + \text{UOICBZZ} + \text{USICBZZ} + \text{WXICBZZ} \end{aligned}$$

$$\text{POICBUS} = \Sigma \text{POICBZZ}$$

State and U.S. total consumption of these products, which includes electric utility consumption of petroleum coke, is calculated:

$$\begin{aligned} \text{POTCBZZ} = & \text{ABTCBZZ} + \text{COTCBZZ} + \text{FNTCBZZ} + \text{FOTCBZZ} + \\ & \text{FSTCBZZ} + \text{MBTCBZZ} + \text{MSTCBZZ} + \text{NATCBZZ} + \\ & \text{PCTCBZZ} + \text{PLTCBZZ} + \text{PPTCBZZ} + \text{SGTCBZZ} + \\ & \text{SNTCBZZ} + \text{UOTCBZZ} + \text{USTCBZZ} + \text{WXTCBZZ} \end{aligned}$$

$$\text{POTCBUS} = \Sigma \text{POTCBZZ}$$

Additional Notes on Other Petroleum Products

1. In the “Energy Consumption Estimates by Source” tables in this report, a petroleum column called “Other” comprises the other

products, including petroleum coke consumed by electric utilities (POTCB and POTCP). In the "Industrial Energy Consumption Estimates" tables, the petroleum "Other" column is the other petroleum products consumption total for industrial use (POICB and POICP).

2. The data for "value added by manufacture" that are used to allocate many of the other petroleum products are from the Department of Commerce, *Census of Manufactures* reports. For all years, several States' data were withheld from publication to avoid disclosing operations of individual companies. The total withheld data was apportioned to the withheld States on the basis of those States' proportional values in the previous year.

In 1982, all respondents to the Census of Manufactures survey were requested to report their inventories at cost or market prior to accounting adjustments for "last in, first out" cost. This is a change from prior years in which respondents were permitted to value their inventories by using any generally accepted accounting valuation method. Consequently, data for value added by manufacture for 1982 are not comparable to the prior years' data.

Petroleum Summaries

This section describes the method of estimating consumption by the major end-use sectors within the States for all petroleum data series. Table A2 on page 356 of this section indicates which petroleum products are consumed in each of the five major end-use sectors. In the preceding portions of this section, end-use consumption estimates have been derived for each petroleum product. These petroleum product subtotals are now summed, in physical units of thousand barrels and in Btu, to create estimated end-use consumption for all petroleum products.

Residential Sector

Petroleum products consumed by the residential sector are: distillate fuel (DF), kerosene (KS), and liquefied petroleum gas (LG). For the residential sector, the State and U.S. totals in physical units are:

$$\begin{aligned}\text{PARCPZZ} &= \text{DFRCPZZ} + \text{KSRCPPZZ} + \text{LGRCPZZ} \\ \text{PARCPUS} &= \Sigma \text{PARCPZZ}\end{aligned}$$

State and U.S. totals in Btu are:

$$\begin{aligned}\text{PARCBZZ} &= \text{DFRCBZZ} + \text{KSRCBZZ} + \text{LGRCBZZ} \\ \text{PARCBUS} &= \Sigma \text{PARCBZZ}\end{aligned}$$

Commercial Sector

The commercial sector's use of petroleum products includes: distillate fuel (DF), kerosene (KS), liquefied petroleum gases (LG), motor gasoline (MG), and residual fuel (RF). In physical units, the State and the U.S. totals for the commercial sector are calculated:

$$\begin{aligned}\text{PACCPZZ} &= \text{DFCCPZZ} + \text{KSCCPZZ} + \text{LGCCPZZ} + \text{MGCCPZZ} + \text{RFCCPZZ} \\ \text{PACCPUS} &= \Sigma \text{PACCPZZ}\end{aligned}$$

State and U.S. totals in Btu are:

$$\begin{aligned}\text{PACCBZZ} &= \text{DFCCBZZ} + \text{KSCCBZZ} + \text{LGCCBZZ} + \text{MGCCBZZ} + \text{RFCCBZZ} \\ \text{PACCBUS} &= \Sigma \text{PACCBZZ}\end{aligned}$$

Industrial Sector

Petroleum used in the industrial sector includes: asphalt and road oil (AR); distillate fuel (DF); kerosene (KS); liquefied petroleum gases (LG); lubricants (LU); motor gasoline (MG); residual fuel (RF); and the 16 products that are already summed in the "other petroleum products" (PO) subtotal. The State and U.S. total estimates in physical units are:

$$\begin{aligned}\text{PAICPZZ} &= \text{ARICPZZ} + \text{DFICPZZ} + \text{KSICPZZ} + \text{LGICPZZ} + \text{LUICPZZ} + \text{MGICPZZ} + \text{RFICPZZ} + \text{POICPZZ} \\ \text{PAICPUS} &= \Sigma \text{PAICPZZ}\end{aligned}$$

State and U.S. totals in Btu are:

$$\begin{aligned}\text{PAICBZZ} &= \text{ARICBZZ} + \text{DFICBZZ} + \text{KSICBZZ} + \text{LGICBZZ} + \\ &\quad \text{LUICBZZ} + \text{MGICBZZ} + \text{RFICBZZ} + \text{POICBZZ} \\ \text{PAICBUS} &= \Sigma \text{PAICBZZ}\end{aligned}$$

Transportation Sector

Petroleum products used in the transportation sector are: aviation gasoline (AV), distillate fuel (DF), kerosene-type jet fuel (JK), naphtha-type jet fuel (JN), liquefied petroleum gases (LG), lubricants (LU), motor gasoline (MG), and residual fuel (RF). The State and U.S. totals in physical units are:

$$\begin{aligned}\text{PAACPZZ} &= \text{AVACPZZ} + \text{DFACPZZ} + \text{JKACPZZ} + \text{JNACPZZ} + \\ &\quad \text{LGACPZZ} + \text{LUACPZZ} + \text{MGACPZZ} + \text{RFACPZZ} \\ \text{PAACPUS} &= \Sigma \text{PAACPZZ}\end{aligned}$$

State and U.S. totals in Btu are:

$$\text{PAACBZZ} = \text{AVACBZZ} + \text{DFACBZZ} + \text{JKACBZZ} + \text{JNACBZZ} + \text{LGACBZZ} + \text{LUACBZZ} + \text{MGACBZZ} + \text{RFACBZZ}$$

$$\text{PAACBUS} = \Sigma \text{PAACBZZ}$$

Electric Utility Sector

Petroleum products consumed by the electric utility sector are: distillate fuel (DF), kerosene-type jet fuel (JK), petroleum coke (PC), and residual fuel (RF). In physical units, the State and U.S. totals are:

$$\begin{aligned}\text{PAEUPZZ} &= \text{DFEUPZZ} + \text{JKEUPZZ} + \text{PCEUPZZ} + \text{RFEUPZZ} \\ \text{PAEUPUS} &= \Sigma \text{PAEUPZZ}\end{aligned}$$

State and U.S. totals in Btu are:

$$\begin{aligned}\text{PAEUBZZ} &= \text{DFEUBZZ} + \text{JKEUBZZ} + \text{PCEUBZZ} + \text{RFEUBZZ} \\ \text{PAEUBUS} &= \Sigma \text{PAEUBZZ}\end{aligned}$$

Total Consumption of Petroleum Products

Total consumption of all petroleum products is the sum of all of the individual product totals. The State and U.S. physical unit totals are:

$$\begin{aligned}\text{PATCPZZ} &= \text{ARTCPZZ} + \text{AVTCPZZ} + \text{DFTCPZZ} + \text{JKTCPZZ} + \\ &\quad \text{JNTCPZZ} + \text{KSTCPZZ} + \text{LGTCPZZ} + \text{LUTCPZZ} + \\ &\quad \text{MGTCPZZ} + \text{RFTCPZZ} + \text{POTCPZZ} \\ \text{PATCPUS} &= \Sigma \text{PATCPZZ}\end{aligned}$$

State and U.S. totals in Btu are:

$$\begin{aligned}\text{PATCBZZ} &= \text{ARTCBZZ} + \text{AVTCBZZ} + \text{DFTCBZZ} + \text{JKTCBZZ} + \\ &\quad \text{JNTCBZZ} + \text{KSTCBZZ} + \text{LGTCBZZ} + \text{LUTCBZZ} + \\ &\quad \text{MGTCBZZ} + \text{RFTCBZZ} + \text{POTCBZZ} \\ \text{PATCBUS} &= \Sigma \text{PATCBZZ}\end{aligned}$$

Additional Calculations

Additional calculations are performed by CSEDS to provide data that are used in EIA's *Annual Energy Review* and published in the conversion factor section of EIA's *Monthly Energy Review*. Conversion factors for all petroleum products consumed by each sector, as well as data for the residential and commercial sectors combined, are calculated by CSEDS.

The conversion factor for all petroleum products consumed by the residential sector is calculated:

$$\text{PARCKUS} = \text{PARCBUS} / \text{PARCPUS}$$

The conversion factor for all petroleum products consumed by the commercial sector is calculated:

$$\text{PACCKUS} = \text{PACCBUS} / \text{PACCPUS}$$

Consumption of all petroleum products by the residential and commercial sectors combined, in physical units, in Btu, and the average conversion factor are calculated:

$$\text{PAHCPUS} = \text{PARCPUS} + \text{PACCPUS}$$

$$\text{PAHCBUS} = \text{PARCBUS} + \text{PACCBUS}$$
$$\text{PAHCKUS} = \text{PAHCBUS} / \text{PAHCPUS}$$

The conversion factor for all petroleum products consumed by the industrial sector is calculated:

$$\text{PAICKUS} = \text{PAICBUS} / \text{PAICPUS}$$

The conversion factor for all petroleum products consumed by the transportation sector is calculated:

$$\text{PAACKUS} = \text{PAACBUS} / \text{PAACPUS}$$

The conversion factor for all petroleum products consumed by electric utilities is calculated:

$$\text{PAEUKUS} = \text{PAEUBUS} / \text{PAEUPUS}$$

The conversion factor for all petroleum products consumed by all sectors is calculated:

$$\text{PATCKUS} = \text{PATCBUS} / \text{PATCPUS}$$